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EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON.

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EDITORIAL NOTES—GAS, &c.

Co-Partnership and the Gas Industry.

THE first time that Co-Partnership, in its fully developed form as applied to gas undertakings, has been under discussion by the gas profession was at the meeting last Thursday of the Southern Association. Sir George Livesey, the protagonist of the movement in the industry, read a paper on the subject, in which paper he did not go nearly to the length he might have done in his plea for the cause which is so near his heart, and in the prosecution and defence of which he has shown such invincible spirit and never-failing courage. Sir George got what he hoped he would get, and that was an amount of criticism. But what was the total of that criticism? No one had temerity to stand up and say that, as a constructive piece of work, the scheme was bad, and that its influence upon men's lives and the Co-Partnership Companies' affairs was not good, but only that, in the naked working costs of the Companies, as coldly presented in their accounts, there was nothing exceptional to show that Co-Partnership was justified, and that goodwill and good service could be and are obtained by other means. But goodwill, good service, and working costs are not the sole boundary walls of co-partnership, nor can they be constituted sole arbiters of justification. However, Sir George invited criticism; he had what he wanted. Had the discussion on the paper been flattering, and not in any way critical, the time occupied in preparing and reading the paper would to him have been lost; for Sir George would have gone his way, wondering whether, for his sake alone, things had been left unsaid that might have been said by those who hold executive position in the industry. There was no question, however, that what there was to be said was said; and Sir George was happily in the position of being able to leave the meeting with the satisfactory thought that as what was said was the worst that could be advanced, the co-partnership system was free from fault as "cloistered virtue," and in solidity and base was nothing short of pyramidical.

It will do no harm to further deliberate over this matter after hearing the discussion last Thursday afternoon. The Protean labour question is ever with us. We are continually trying to think of ways and means of getting rid of the disturbing element and the future uncertainty; and the end of all meditation and controversy is that the interests of capital and labour must be in some way united. But with all the thought, and the one conclusion, action generally to attain the end has been of such mediocre character that militant Trade Unionism is more firmly established than ever, and the pernicious doctrines that create unrest are being more vigorously than ever preached at the street corners, and inculcated on every conceivable occasion and by every conceivable means. And what is more, Trade Unionism and Socialism have linked arms, and have started to openly march for the selfsame goal. So while forces and ambitions are being united and consolidated in this manner, the inevitable is happening, and that is the widening of the breach between capital and labour. In this way, the strife between them will not diminish. Superficial contentment and complaisance in works there may be; but what is there underneath? A keen, if masked, sense of injustice. Sick, pension, and burial funds—all very good in their way, and all conceived and promoted with the best of benevolent and politic intentions—after all prove, when trouble comes, but poor ties between masters and men. They do not meet the desire for greater personal possession during years of health and strength; and they are looked upon as shadowy things in which there is no personal property, and which may or may not be of advantage during life. If what has been done short of the co-operative and co-partnership movements had been effective in appeasing labour, and in co-ordinating the interests of capital and labour, there would be no reason for the continued existence of militant Trades Unions.

Co-partnership does co-ordinate the interests of capital and labour; and it is going a very big step indeed beyond the benevolent and politic provisions that are generally to be found in industry. Those provisions have not weakened Trade Unionism or Socialism; they have not discharged the *raison d'être* of either. Both, despite what has been done, have progressed in the affections of workers, because they are the only roads open by which they see opportunity for improving position. The road may be long, and it may be rough, the method of procedure may be ill-cast; but to the worker, in the absence of something better, there appears to be in it all a possible tangible result. Is there anything that will check this movement, and give satisfaction? If we discern rightly the end to the aims and objects of Trade Unionism and of Socialism, that end is to be found in something that has taken form in the co-partnership system. History proves it. In the early days of the Gas Workers' Union, the leaders did not find co-partnership to their taste; for verily we believe it was giving an effective finish to their programme in a too precipitate manner. It was a short-cut to the end that they promised the worker should be fought for. But they could not justify their existence and at the same time oppose the proffered material advancement of their members. The one clashed with the other; and to-day leaders of the Union are passive onlookers at the workings of co-partnership, though it enervates their authority, and gives immediate satisfaction to their claims, when worked in its complete form. Where, we ask, in the whole gas industry has the power of Trade Unionism been weakened the most; where, we ask, has disturbing Socialism the least opportunity of gaining entry? We hear the no uncertain cry of "Here" from some five or six works in the whole industry; and there we find co-partnership—the trade union of capital and labour—or its cognate, profit-sharing, has taken deep root. A sincere reply may be asked to the plain question, Is it not so? Where co-partnership exists, the men have become property owners, they have acquired an interest in the business, and there are few of them who would do anything to interrupt the growth of that which they had secretly longed for, and to get which there are the manifestations all round us of the beginnings of open rebellion.

From the national and industrial standpoints, we regard this effect of co-partnership as of vast importance, and that effect alone more than justifies all employers who offer this means of pacification, advancement, and provision, and of assistance in moderating the swelling stream of Socialism and discontent. But there are employers of labour, who do not regard this matter from the national and the industrial standpoint. A narrower interest asks for some other test. The expenditure side of the accounts of the Co-Partnership Gas Companies are examined to find the financial proof of better work emanating from co-partnership. The item of carbonizing wages is the only one upon which they can fasten. But the carbonization test has its limitations; and the supersession of hand labour by machinery, the conditions of the retort-houses themselves, and the interference with cost of carburetted water gas figures, make any comparison under this head between one gas-works and another totally valueless. Individual conditions alter cases. Sir George Livesey is right; one can only compare the present with the past of an undertaking, and take a comprehensive survey of the conditions generally. Doing so, what do we find? That the co-partnership undertakings have been supplying gas cheaper during the period of co-partnership than they have done before—cheaper, too, than several contiguous undertakings; and, notwithstanding this, their accounts have

borne the additional charge of the co-partnership bonus. We also find that the men in the South Metropolitan Company have money invested in the undertaking to the extent of hundreds of thousands of pounds, and in the Commercial and South Suburban Companies to the extent of several thousands. We are bid to measure the advantages of co-partnership by a sentimental standard. How can we conscientiously do so with such material advantages in evidence as these?

It is for every gas manager and director of a gas company to ask himself, "What is it that these Co-Partnership Com-"panies have got and enjoy that we do not possess? Pro-"ductively and commercially, allowing for the conditions of "environment, these Companies are doing as well as we are. "In addition, their men have got what ours have not got, "and that is a considerable property in the undertakings; "and, when old age comes, it will find them with something "more than the pittance that goes by the name of [forgive "the description when applied to some Companies] pension. "The Companies are assured against any serious labour "troubles; are we? For the men, the service of these "Companies contains a brighter hope for the future; for the "Companies themselves uncertainty has been displaced by "certainty." But beyond all this, here is a responsibility and a duty resting upon employers towards their men. Joint-stock enterprise has robbed the men of those humanizing and influential ties that at one time existed. Something is required to replace these; and that something is to be obtained by inviting the men to unite, and giving them an opportunity of uniting, themselves to the enterprise by stronger ties than mere daily service for wage provides. We can bear testimony, having witnessed the development of this scheme, from before those dark days of strike and distress in South London, and through that strike to now, how ownership in small degree has fostered a desire to increase, and how ownership has developed self-respect, marked in personal appearance away from the works and in the home surroundings. The thriftless have been made thrifty; and the negligent, careful. Elevation of character—moral and intellectual—has accompanied the progress of ownership. Is it at all possible that the good the scheme has done the men personally has no influence upon the affairs of the Companies? We cannot think it, and have excellent cause for believing otherwise. The good that has been done the men cannot be shuffled off like a coat when about their partners' business, which is also their own. Just consider the difference in the position of these men as proprietors and in other respects now and before co-partnership; just consider what these men would have been short of to-day if there had been no co-partnership. They are not men devoid of intelligence and appreciation. Is it not worth while to go and do likewise?

Repairing Gasholders—Utilizing Burnt Spent Oxide.

THE paper that was presented by Mr. J. Tysoe at the meeting of the Southern District Association last Thursday, was one of those contributions that are very acceptable at professional meetings. There is always a charm in hearing about experiences of new methods of doing work in a facile and expeditious manner, and in learning how to gain fresh economies. Mr. Tysoe headed his paper "Two Novelties "in Gas-Works Practice." Perhaps he would be the first to now admit that to describe the use of burnt spent oxide in the purification of gas from sulphuretted hydrogen as a novelty is an error; but certainly every credit is due to him for introducing the plan of one of his foremen that allows of the patching of gasholder sheeting without putting the holder —no matter whether single or telescopic—out of use, and without loss of gas. If engineers would only make a practice of collecting the "wrinkles" for doing work that emanate from the practical brains of those in their fitting-shops, and give them to the industry, there would be much cause for the acknowledgment of mutual indebtedness. What appears to be something small in its application at one works would perhaps represent something large in the aggregate of its economy if adopted throughout the industry; and therefore in these columns we shall always give welcome to suggestions that have been found of practical value in the repair and maintenance work of gas undertakings. The gas-lock introduced by Mr. Tysoe for use in the repairing of gasholder sheeting has been under trial at the East Greenwich station of the South Metropolitan Gas Company for some months; and, simple as his description shows it to be, it has been found very effective under almost every conceivable condition, and it enables a very presentable repair to be made. We do not gather that this plan of repairing holder sheeting has been protected in any way; but we do hope that those who realize advantage from the publication of the details of the ingenious idea will not forget that it is the product of the brain of one of the foremen at the East Greenwich Gas-Works.

As mentioned, the second part of the paper treated upon the use of burnt spent oxide for the purification of gas from sulphuretted hydrogen. To the spent oxide, after the recovery of the sulphur in the manufacture of sulphuric acid, Mr. Tysoe said, "no value had been attached so far as he "was aware; and it has been a waste product for which no "use could be found." Had Mr. Tysoe heard, before he read his paper, the remarks of Mr. J. N. Reeson and Mr. Williams in the discussion, and Mr. T. Glover in seconding the vote of thanks to the readers of papers at the meeting, he would doubtless have desired to expunge the above-quoted remark from the paper. Mr. Glover has known one firm of chemical manufacturers who have been selling this burnt spent oxide for purification purposes for years past. And that is not the only chemical manufacturing firm doing business with gas-works in the burnt material. Only the previous Saturday, Mr. W. A. Twine, of the Nechells Chemical Works, was telling the Midland Juniors that he knew of about twenty gas-works employing such oxide at the present time; and there had been very good reports received as to its working. "The day," he added, "would "undoubtedly come when it would be the usual thing for gas "undertakings to send to the chemical manufacturers their "oxide containing 50 per cent. of free sulphur, and get it back "again containing nothing." Spent oxide is not now realizing what it did a decade or so ago; and if gas-works themselves supply a market for the burnt oxide, there is no reason why the spent material should not realize a greater value than it has been doing of late. However, from what is pointed out here, Mr. Tysoe's second "novelty" is not particularly new, though little has been heard of it. Still he deserves thanks for bringing the subject forward; and the result we hope will be that further information from experience will find its way to our columns to help onward, in the cause of economy, the utilization of this discarded product, of which hundreds of thousands of tons must have been wasted in the time of the gas industry. There is much yet to be learned about this re-use of burnt spent oxide in purification. There is the question as to its simple preparation before employing it in the purifiers, and as to the best position for its use in a series of purifiers. There will also be technical interest in learning more of the causes that make it so active in absorbing sulphuretted hydrogen, and the reasons for variations in its activity. On these matters there is a good deal of theorizing at present; and therefore any communications from readers who can throw further light on the subject will be appreciated.

The Prepayment Field not for Electricians.

ELECTRICIANS cannot make up their minds as to the prepayment field. There have been writers who have pointed out that the field is one of great fertility if properly cultivated; and amazing tables of costs and revenue have been worked out showing profit on installations through the consumption of electricity in a year by half-a-dozen 8-candle power lamps in a workman's house. But the workman shows a disinclination to go back to the glimmer of the days of tallow candles, and he eschews the prescriptions and the estimates of his would-be friends the electricians. Time and again other electrical engineers complain of the unreliability of electric coin-meters, and of their initial cost; and unreliability suggests that maintenance expenses are matters that refuse to be slighted. Is there anything in this prepayment supply for the electricity industry? is an interrogation that might well have appeared in the opening line of an article by Mr. L. E. Buckell, in the "Electrical Times" last week; and the article might have ended with the reply "There is not." The article, indeed, is one of the most practical that we have read on the subject. Mr. Buckell deals with the question entirely from the financial aspect, and has nothing to say about the want of reliability of the prepayment meters. As a matter of fact, he seems inclined, for the better class block building flats, to abandon meters entirely, except a check one at each building, and get custom on the flat weekly pay-

ment principle. There is nothing novel in this; the novelty would be in finding a concrete example in which there has been a really tangible profit from such business. Taking what would be the corresponding line of business to that which we term the prepayment business in gas supply, Mr. Buckell fails to discover any profit in it for the electricity supplier. As a rule, a workman receives only a living wage; and he has to "cut his coat according to his cloth." When the living wage was fixed, expenditure for electric lighting was certainly not included in it. That is a matter the electricity industry must set about adjusting if they want to get the working man's custom. Experiments have been made in fitting workmen's houses for electricity; but the result has been that the workman householder takes an early opportunity, when his eyes have been opened, of ruthlessly cutting down his consumption to a point that is not lucrative. With him there are no half-measures. Mr. Buckell finds that, for lighting only, from 20s. to 28s. is about the maximum a workman is prepared to pay per annum; and Mr. Buckell uses these figures in his calculation to ascertain what the electricity supplier is likely to gain or lose by such a customer. For a five-roomed house, the cost of an electricity installation of four to six lights would be approximately £3. The service to each house, under favourable circumstances, would cost not less than £2. A slot meter, which would be the least likely to shy at performing its designed functions, would cost £2 10s. to £3, when a considerable quantity are ordered. Then there is the extension of the network to carry the current into the streets where these customers are situated; and such an extension would cost approximately 5s. a yard, or, assuming—and this is a big assumption!—all the houses along the street are supplied, £1 per customer. From these figures, the total capital cost per consumer, quite apart from the contributions to the power station, network, &c., would be (say) £8 10s.; and 10 per cent. on this would represent 17s. a year—leaving only 3s. to 8s. a year for the cost of generating and distributing current, collection, book-keeping, repairs to installation and meter, and a contribution to the capital sunk in the cables and generating station. Upon the ordinary lines, therefore, there is little chance of the electricity prepayment meter system offering any effectual competition in this lucrative field of the gas industry.

Rating Statistics.

Once more we have been favoured by Mr. James Carter, the Borough Treasurer of Preston, with a copy of his annual statistics with regard to the rates, &c., levied in various towns; and some particulars from them will be found in another column. Though, of course, the compilation does not provide complete figures with reference to rating and other financial matters throughout the country, so as to render it absolutely complete for the purpose of showing the relative position of every town in comparison with every other one, it nevertheless represents a very considerable amount of labour; and as the ninety places now included in the tables embrace both large and moderate-sized towns up and down the country, it may fairly be taken that the figures are, to a large extent at all events, representative of existing conditions in the matter of rating, charges for gas, water, and electricity, and profits from reproductive undertakings. Glancing over the statistics, there is not a great deal of change to be noted in respect of the year 1907-8, as compared with its immediate predecessor. In regard to the amount in the pound which is levied for rates, East Ham and West Ham still come first, but have changed places. While West Ham has come down from 10s. 4d. to 9s. 7d., East Ham has gone up from 9s. 7d. to 9s. 8d. For West Ham to get below 10s. again, is something to be thankful for, on the part of the ratepayers, who will probably derive more satisfaction than regret from the knowledge that they have thus been deprived of the first place in the matter of the amount per pound required for local rating purposes. Six other towns are named by Mr. Carter where the rates are 9s. or more in the pound, as against eight in the preceding year; so that relief has been experienced in other places besides West Ham. The number of cases, also, in which the rates amount to 8s. in the pound or more, is 25 on the present occasion, as against 29 last year—which is still further evidence of improvement. At the other end, we have once more Oxford, Lancaster, and Bournemouth where the rates are 5s. or less in the pound—and in the latter town, be it noted, the rates are not relieved to any extent whatever by profits from reproductive undertakings. There are thirteen places in Mr. Carter's return where the price of gas is 2s. or under per 1000 cubic feet, for domestic supplies. This is the same as last year; and the honour of the lowest charge again belongs to Widnes, with 1s. 3d. per 1000 cubic feet for domestic purposes, and even more favourable terms to large consumers and users of power. One point about the statistics is the number of towns that have recently reduced their charge for electricity. Twelve months ago, there were no less than twelve places named by Mr. Carter where the price for domestic supplies was 6d. per B.T.U.; while on the present occasion there are only two.

Gas and Electric Light Comparisons.

The result of the lecture on "Modern Lighting" which Mr. J. G. Newbigging, the Gas Engineer to the Manchester Corporation, delivered at the Exhibition—a report of which appeared in the "JOURNAL" for the 29th ult.—has led to a friendly argument between Mr. Haydn Harrison and the author in the columns of the "Manchester Guardian." Mr. Haydn Harrison takes exception to Mr. Newbigging's calculation of the relative cost of gas and electric lighting, according to which "the flat-flame gas-burner costs five times, and electric light (tantalum lamp) five-and-a-half times, as much for a given candle power as the incandescent gas mantle." He says that, taking the flat-flame burner as a standard, consuming 5 feet an hour and giving 16-candle power, this meant that the mantle gave 80-candle power for 5 feet per hour, or 16 candles per foot; and that tests made by an independent authority, with several types of mantles, showed an average of 10·5 candles per foot of gas per hour, or a little over three times as much as that of the flat-flame burner; while reckoning the average price of gas in Manchester at 2s. 3d. per 1000 cubic feet, and electricity, which varies from 3·35d. to 2·83d. per unit, and is 1¼d. for street lighting, at the highest of these figures, the cost of 1000 candle-power-hours would be: Flat-flame gas-burners, 8·5d.; gas-mantles, 2·66d.; electric tantalum lamps, 6·7d.; electric osram lamps, 4·3d. To this Mr. Newbigging replied that there was no relation between the light given by gas when consumed in an ordinary flat-flame burner and an incandescent burner; and that in the tests where an efficiency of 10·5 candles per cubic foot of gas was obtained, the worst type of burner and mantles must have been used. He points out that 20 candles per cubic foot is a moderate figure for an incandescent burner with properly adjusted air and gas supplies, with 15, 16, 17, or 18 candle gas, and there would be no greater efficiency with the higher than with the lower quality. He adds that Mr. Haydn Harrison did not give the cost of maintaining the tantalum lamp; but it is stated to have a useful life of 600 hours, and costs retail 2s. 9d. A good gas mantle can be purchased for 4½d.; so that a gas consumer could use over seven mantles for 600 hours' lighting to give equal maintenance costs with electricity. This would ensure him getting a higher efficiency than 20 candles per cubic foot of gas consumed during the whole of that period. But, as a matter of experience, two mantles will last 500 hours, so that the maintenance of incandescent gas lighting is less than one-third that of electricity. The osram lamp, Mr. Newbigging remarks, is practically new and untried, and so it cannot be brought into comparison.

A Recognition of Capacity.

Our readers will see, from the report which appears elsewhere, that the Directors of the Sheffield United Gas Company have elected Mr. Hanbury Thomas, the General Manager, to a seat on the Board, and have also appointed him Managing-Director. Mr. Thomas has been with the Company a quarter-of-a-century; and we think it is only due to him to say we fully share the opinion expressed by the Chairman (Mr. Wilson Mappin) that he has had a large share in bringing the undertaking into its present condition of prosperity. The position of the Company as a commercial concern, and especially the low figure at which its commodity is sold, have attracted much attention of late, not only locally, but in places where questions of gas manufacture and supply have been under discussion. It was in no boastful spirit, or with any idea of reflecting upon other people's management, that Mr. Hanbury Thomas referred to the prices being charged in several towns now as compared with twenty years ago; but merely to show the city authorities and the gas consumers that they are being well served by a Company. As

he pointed out, when acknowledging his election, the Board, under the able chairmanship of Sir Frederick Mappin, have always recognized that, while they have been granted certain privileges by Parliament, they have also had imposed upon them various duties; and this has been the basis of their policy in conducting the affairs of the Company. The effect of this consistent pursuance of a settled policy founded upon a just recognition of right and duty is seen in the satisfaction of the citizens with their gas supply, and the acknowledgment by at all events some very prominent representatives that they could not be better served if the gas undertaking were municipalized, even supposing that Parliament could be induced to sanction the transfer, which is highly improbable in view of the Company's record. We heartily congratulate Mr. Thomas on his promotion to a higher position in connection with the management of their affairs, and the gas consumers on the enjoyment of substantial advantages as the result of that management.

As Director or as Councillor?

Mr. R. Baptie is a Director of the March Gas Company; and Mr. R. Baptie, we have reason to believe, is a member of the Ely District Council. "As a Director of the March Gas Company," he has been writing to Gas Companies asking for information as to their charges and conditions for public lighting and as to the price of gas to private consumers; we do not know positively, but we suspect that he desires to make use of the information as a member of the Ely District Council. In putting his questions, he rather gives the game away by ending his letter of inquiry with the statement that he ventures to ask for the information direct rather than trouble the Secretary of the March Gas Company to obtain it for him. No doubt the Secretary of the March Gas Company is very much indebted to Mr. Baptie for his magnanimous consideration; but if it was solely as a Director of the March Gas Company that Mr. Baptie desired the information, the natural and usual course would have been an official application. Directors do not ordinarily seek to save their officials a little trouble of this kind. Moreover, officials of gas undertakings would not trouble to send round an inquiry circular for much of the information desired by Mr. Baptie. They have it at command if they know where to look for it. It is therefore peculiar that as a Director of a Gas Company, Mr. Baptie should have found it was necessary to address some of the inquiries to anyone outside March. Inquiry circulars are not looked upon favourably in the gas industry, and especially circulars the purpose of which is, as we are somewhat suspicious that of this one is, disguised. When, as a Director of the March Gas Company, Mr. Baptie needs information of the kind again, he will perhaps ask the chief official of the Company for it; when as a member of the Ely District Council he desires information on gas matters, there are plenty of gas engineers round about who will willingly draw up a report for him on the subject on payment of a suitable fee. If our suspicions are ill-founded, an assurance to that effect from Mr. Baptie will find place in the next issue of the "JOURNAL." Letters and circulars of inquiry have been such a nuisance to officials in the gas industry, that Directors above all persons should do their share in abating it.

What is Sauce for the Goose—

No doubt there are a good many people who, if the circumstances of a case seemed to require it, would be prepared to stoutly maintain that what was sauce for the goose need not of necessity be sauce for the gander. At any rate, certain Trades Unionist interests are of this opinion, as was clearly evidenced by a case that has recently occupied a Court in the King's Bench Division for four days. The argument was, however, in this instance at least, unsuccessful; for the Special Jury who were called upon to decide the question, by their verdict upheld the truth of the good old saying that "what is sauce for the goose is sauce for the gander." The case is of some interest, inasmuch as it seems to give a fairly clear illustration of how vastly different things may appear in the eyes of a Trades Unionist, according to whether they are being done by him to someone else or by someone else to him. The nominal plaintiff, an ironmoulder, brought the action against Messrs. Ashwell and Nesbit, Limited, of Leicester (who are hydraulic and general engineers), and the Leicester District Engineering Trades Employers' Association, for conspiring to prevent, and for actually preventing, him obtaining engagements; and he claimed an injunction restraining them, or their agents, from preventing people employing him, or causing anybody to cease to employ him, or otherwise from molesting or interfering with him in following his calling. Incidentally, a claim for damages was made; but the action was in reality brought by his Union. Eighteen months ago, plaintiff, on his own initiative, left Ashwell and Nesbit's service; and he stated that since that time the defendants had prevented one firm employing him, induced two others to discharge him, and generally adopted a hostile attitude. The three firms referred to are members of the defendant Association—a body of employers, Mr. Rufus Isaacs, for the plaintiff, explained, "bound together for mutual defence." Here, then, we have an admittedly more peaceful organization than the Trades Union, inasmuch as "attack" is not said to be one of its reasons for existence. There was a dispute between plaintiff's Union and the firm of Ashwell and Nesbit; and the Union "suggested" he should leave them. In fact, they passed a resolution that the firm's shop was in future to be closed to all Union men, and classed as "unfair." A letter was produced from the firm referring to the ban that was in consequence of the dispute placed on the plaintiff by the Association, and saying that on a settlement of the trouble this ban would come to an end. Mr. Rufus Isaacs said it was clear that there was a conspiracy; and he submitted that every man had a right to carry on his lawful trade without interference, and a combination against that right was unlawful and actionable. This argument may be commended to those non-Unionists in the South Wales coalfield who have during the past year or two been the subject of "peaceful persuasion" of a particularly irresistible character, at the hands of the Miners' Federation. For the defence, Mr. Carson said that the plaintiff was driven into Court by the tyranny of the Union, to bring an action against masters for whom he had worked for very many years, and for whom he wished to go on working; and he emphasized the fact that all the firms referred to in the case were members of the employers' Association. As already intimated, the Jury found for the defendants; and really there does not seem anything unfair in the conclusion that, if the members of a men's Union are to be entitled to decide for what masters they shall work, the members of an employers' Association should have equal liberty to determine what men shall be employed by them.

For the Suppression of Smoke.

A good deal has already been accomplished by the Coal Smoke Abatement Society in the way of drawing attention to the evils which are caused by smoke in our larger cities and towns; and the need of continuing these efforts, if any real remedy is to be found, is fully recognized by Sir W. B. Richmond, K.C.B., R.A., as well as by those working with him. This was proved by his remarks when opening a general discussion on the subject under the auspices of the Royal Sanitary Institute last Thursday. He pointed out that they had to fight a demon which was supported by authority, and admitted that it was of not the slightest use the Society going on with the hard work they were doing unless they had the voice of the people with them. Public opinion must be roused; and no doubt general discussions such as that which took place last week (a report of which appears in another part of this issue) are of substantial assistance towards this end. The subject is a large one; and the different aspects were well represented by the speakers. Dr. Parkes, the Medical Officer of Health for Chelsea, advocated the removal of the word "black" as defining the nature of the smoke, the doing away with special privileges claimed by statutory companies, and the abolition of the words exempting private dwellings. The effect of the last-named amendment of the Act would apparently be to put an end to the use of coal in houses; for Dr. Des Vœux, of the Coal Smoke Abatement Society, stated that, in spite of numerous tests carried out by them in conjunction with the Office of Works, "they had been unable to discover any grate which consumed all the smoke from a fire of bituminous coal." He, however, expressed the opinion that there should be some public authority to decide which grate should be employed and which not. Mr. W. D. Scott-Moncrieff pointed out that these tests confirmed conclusions that he gave voice to a quarter of a century ago; and he also drew attention to the fact that on the same occasion he exhibited a material from which the gas had been partially withdrawn, and which material was, for practical purposes, the same as had since been

introduced as coalite. In fact, coalite was mentioned a good deal in the course of the discussion; and Dr. Des Vœux, while stating that he was favourably impressed with it, said that the reports which he had received from friends as to its use in a kitchen range were "not so favourable as might have been hoped." He added that the Society had officially tested and reported on coalite; and that he trusted before long this report would be printed and published. Dr. Rideal showed how little need there was to fear the sulphur which was contained in gas, when compared with that given off in the burning of coal in a grate; and Mr. F. W. Goodenough brought the discussion to a close by quoting some remarkable figures showing the increased use of gas cooking and heating stoves in the district of the Gaslight and Coke Company within the past three years. The advantages enjoyed by gas as a remedy for the smoke nuisance are not shared by electricity, because in the generation of the current it sometimes happens that much black smoke is found to be thrown off into the atmosphere.

Calcium Cyanamide as a Fertilizer.—In the article on the above subject which appeared on p. 242 of the "JOURNAL" for the 22nd ult., it should have been stated that the main patents covering the process of preparing calcium cyanamide by heating calcium carbide in a current of nitrogen or by electrically smelting a mixture of lime and carbon in a current of nitrogen, were taken out by Dr. Adolph Frank, of Charlottenburg.

Gas as a Fog Disperser.—In the "JOURNAL" last Tuesday it was mentioned that the London County Council would, at their meeting on that day, have before them a report by the Public Control Committee on the subject of an apparatus invented by M. Demetrius Maggiora for the dispersal of smoke by means of discharges of gas. No action was taken upon the report, as the matter is under the consideration of the Director of the Meteorological Office, who will advise the Committee as to the suitability of the apparatus for the atmosphere of London.

Presentations to the Honorary Secretaries of the Manchester Gas Exhibition.—A gathering of exhibitors at the recent Gas Exhibition in Manchester took place last Thursday, when Mr. William Batt, on their behalf, presented the Joint Honorary Secretaries—Mr. H. Kendrick, of Stretford, and Mr. W. Whatmough, of Heywood—with small tokens of the appreciation by the exhibitors of their efforts in organizing the arrangements and carrying them through. The gift to Mr. Kendrick was a drawing-room cabinet, and Mr. Whatmough's a silver table-centre.

Manchester and District Junior Gas Association.—In the "JOURNAL" for the 10th of September, it was announced that Dr. Harold G. Colman had promised to give a lecture to the members of this Association on the 23rd inst. We learn from the Hon. Secretary (Mr. Alfred L. Holton) that Dr. Colman will deal with the subject of "Chemical Changes occurring in Carbonization in Horizontal, Inclined, and Vertical Retorts." After some introductory remarks, he will explain the general chemical reactions which take place when coal is heated in the absence of air, and trace the course of these reactions during the process of carbonization. The subject is a very interesting one, and the lecture should attract a full attendance of members.

An Object-Lesson in Inverted Incandescent Gas Lighting.—Next Monday the Express Dairy Company will open a new depôt at No. 19, St. Bride Street, E.C.; and as no expense has been spared, in decoration and lighting, to make the saloons comfortable and attractive, it is to be hoped they will meet with well-deserved patronage. The illumination of the premises, both ground floor and basement, is most brilliant, and is obtained entirely by the use of inverted gas-burners. Anyone requiring a good light, and wishing to learn how it may be obtained, will do well to visit the establishment about five o'clock in the afternoon. Not only is the light furnished by these neat little burners and fittings very fine, but it is also economical. The installation has been carried out under the direct supervision of the Gaslight and Coke Company, which is an assurance of itself that the work has been scientifically and properly done.

Indebtedness of Local Authorities.—The fifty-fourth number of the Statistical Abstract, which has just been issued, states that the total outstanding loans of the local authorities of the United Kingdom at the end of the financial year 1904-5 amounted to £544,715,088. In 1883-4, the total indebtedness was £192,995,873. There has therefore been an increase of £351,719,215 in 21 years. The figures for the three kingdoms are as follows:—

	1883-4.		1904-5.
England and Wales .	£164,879,947	..	£466,459,269
Scotland	21,884,092	..	61,338,728
Ireland	6,231,834	..	16,917,091
Total	£192,995,873	..	£544,715,088

The amount for England and Wales in 1904-5 includes £45,943,557 in respect of the loans of the Metropolitan Water Board. The National Debt in 1883-4 was £745,645,953, while in 1904-5 it was £796,736,491; so that the increase in the interval has amounted to £51,090,538.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 585.)

THE week just closed on the Stock Exchange has been one of almost as highly strung tension as any of its recent predecessors. It has been a period of hopes and fears; of rapidly-changing moods, ranging almost from optimism to desperation; and unhappily the worst mood was the latest. The opening was rather shy at first, but became much more cheerful as a less dark view of American affairs gained ground. Prices were rather better; both Consols and Home Rails leading. The general attitude on Tuesday was fair also. The fortnightly settlement was regarded hopefully, despite stiff money rates; and there was still some rise left in prices. Wednesday was rather doubtful, on the American difficulty not making progress towards a solution. But some markets were buoyant—notably Home Rails and South African. On Thursday, the anxiety regarding the monetary outlook increased; and though a rise in the Bank rate that day was not thought of, it was felt that the drain of gold westward could not keep on much longer without bringing it about. On Friday, there was a general breakdown, even those who had hoped on gave way at last. Liquidation proceeded freely; and, as a matter of course, prices all round sustained a considerable fall—Americans being the worst. On Saturday, the persistent gloom continued, and liquidation and bad prices acted and reacted upon each other; the failure of one firm intensifying the pressure. In the Money Market, there was a good deal of uneasiness in rates for short loans, and borrowers and lenders could not always get to terms. Discount rates steadily stiffened, and closed very firm. Business in the Gas Market was about on a par in point of volume with that of the preceding week. The general tendency was very good considering the agitation which was raging elsewhere, and which is always liable to become infectious. Two or three issues had falls; but, on the other hand, some of importance had an advance. Among these, Gaslight and Coke ordinary was conspicuous with a rise of a point. Transactions in the earlier half of the week touched 90¾; but later on 92 was repeatedly marked. The secured issues were moderately active; the maximum changing hands at from 85¾ to 87¾; the preference at from 103¼ to 104⅛; and the debenture at from 82 to 83. South Metropolitan was moderately busy at the old figures—transactions being within the limits of 119-120. The debenture was done at 81½. Commercials were hardly touched; two bargains in the 4 per cent. at 101 and 103 being the sum total. In the Suburban and Provincial group, Brentford old marked 244, ditto new 183 (a fall of 3), Brighton "A" 155 (a fall of 2), South Suburban 114¾ and 115, Tottenham "A" 122, and West Ham 103½ and 102. The Continental Companies were still quiet. Imperial marked 172 and 173¼ *cum div.*, and from 168½ special to 170 *ex div.* European fully-paid was done at 22½, and ditto part-paid at 17½ and 17—a fall of ½. Among the undertakings of the remoter world, Bombay changed hands at 6⅝, Monte Video at 11⅛, Primitiva at 6 11/16, ditto preference at 5 and 5 1/32, ditto debenture at 93, River Plate at 12⅝ to 13, and San Paulo at 13¼.

ELECTRIC LIGHTING MEMORANDA.

Provision for Depreciation—The Distinction between Municipalities and Company Undertakings in Dealing with the Question—"Intelligent Fitting," and How to Show that Electricity is as Economical as Gas—The Lighting of Public Institutions.

IN electrical circles, the question of provision for depreciation has again come to the front through a report by Sir Alexander Kennedy on the reserves of the electricity undertaking of the Edinburgh City Council, and through a letter (to which the pseudonym "Olim" is attached) that has appeared in the "Electrical Times," and to which "Chesterfield Junior," the handler of financial topics in our contemporary, has devoted attention. The question is one of policy, and not one that brings even competing interests into any sharp contest such as, it is understood, the subject of the relative superiority of commodities occasionally brings about. It is also one that concerns all intelligently interested in the conduct of industrial and trading undertakings. But many municipal authorities are prone, in their desire to show to the ratepayers as good a financial face as possible, to shun this subject of depreciation; and they try to shield themselves from criticism by asserting that their practice is the common one, that companies do not do much, if anything, better than they are doing, and—this is the favourite unsound theory of administrators of municipal trading undertakings—that the repayment of capital is the equivalent of a depreciation fund. How spurious all these arguments are a very little investigation proves.

Edinburgh is in a much better and sounder condition financially in connection with the city electricity undertaking than—we quote Sir Alexander Kennedy—"most other cities and burghs." This being so, we cannot see what good is to be obtained by the Town Clerk making inquiry of other cities and towns as to their method of dealing with depreciation, sinking funds, &c. Edinburgh has nothing much to learn from them—only that the majority cannot financially hold a light to Edinburgh. The department has a full reserve equal to 10 per cent. of the capital; but Sir Alexander,

"in view of the *uncertainty as to the life of certain portions of the machinery and plant*, and particularly as to *the durability of the insulation of the mains*," hopes that the Council will form an additional depreciation fund of perhaps 5 per cent. of the total capital, in addition to the statutory reserve fund. The common practice is undoubtedly, in the judgment of this expert (who has not about him the attributes of a croaker or a pessimist), the wrong one; but, for convenience, the municipal advocates of neglect in this particular of depreciation will not admit to the uncertainty of life that an expert of Sir Alexander's experience has to own up to. "Olim" in the letter to which allusion is made, also urges the provision of a 5 per cent. depreciation fund for municipal electricity undertakings; and he has at his back the opinion of Sir Alexander as to the correctness of this percentage even in the case of such a (among its contemporaries) soundly financed undertaking as that at Edinburgh. But on the other hand, "Chesterfield Junior" does not regard 5 per cent. as being moderate. We ask: Is it "Chesterfield Junior" or Sir Alexander Kennedy whom one should accept as a trustworthy guide in this matter? The financial writer of our contemporary is one of those who hold that, where the annual redemption provision of municipal undertakings is insufficient to cover the normal rate of depreciation, an additional contribution should be made annually to the reserve fund to make up the deficiency. Is that really sufficient under the conditions of financing municipal trading undertakings? Supposing the redemption period has correlation with the life of the subjects, what is to happen if there has not been provision for depreciation so as to allow for renewal? Borrowing has to be repeated; and the same old course of sinking fund and interest has to be pursued. By clinging to such a policy a municipal undertaking will never be in any better position in regard to its capital obligations. There is a depth of meaning in Sir Alexander Kennedy's sage advice to the Edinburgh Corporation as to being prepared for the most unfavourable circumstances which could possibly occur in the future.

Now as to what companies are doing. It is a common thing to quote one or two London concerns as typifying the best that electricity companies are doing in the matter of depreciation. In point of fact, there is a great distinction between a municipality working on borrowed money, and a concern working on privately subscribed capital; and if electricity companies are following the practice of gas companies in this regard, they can—apart from all that the great distinction in capital involves—show municipal electricity departments some good points in the matter of sound finance. In the case of gas companies, when once plant has been built, it imposes no further charge upon capital. The cost of repair is defrayed from revenue; and when the day comes for its replacement, the cost is also discharged from revenue. In the gas legislation of the last few years, too, provision has been made for, in addition to reserve and insurance funds, the accumulation of a renewals fund equal to 10 per cent. on capital, in order that replacements may be made from it without putting any sudden burden on revenue, or having to spread the charge over the years during which provision should also be proceeding for the further replacement. The Westminster Electric Supply Corporation is a private concern that is quoted as making provision for depreciation, but not by specific appropriation up to the 5 per cent. advocated for municipal undertakings. Why, people ask, if 5 per cent. is not applied here, should it be in the case of a municipal concern? The reply is that the Westminster Company, in addition to their specific appropriation, make drafts upon their revenue every year for large renewals; and they have now in their depreciation, sinking, and reserve funds, no less than £237,034, or equal to 22 per cent. of their expended capital. The Edinburgh Electricity Department has only a reserve fund amounting to 10 per cent. of the expended capital; and Edinburgh stands high in financial stability among municipal electricity undertakings.

Some nice little compliments are, perhaps unconsciously, paid to gas by a writer on "Installation Topics" in the "Electrical Times." He exhorts to "intelligent installation," in order that the price of electric lighting may be got down to something like the price paid for the wasteful use of gas. It is clear that, in the mind of the writer on "intelligent" electrical installations, the price of gas lighting is so cheap that gas can be burned with impunity, leaving the householder still under the impression that he is enjoying the use of a very economical illuminant. It is a matter of difficulty, says this mentor, to persuade a new consumer that electric light, differing radically as an illuminant from gas and oil, needs special treatment; and it is a very special treatment and a curbing of the amenities of life that are desirable if the cost is to be got down to a par with gas. We read that nine out of every ten persons when changing over merely replace their gas-fittings by electric pendants or brackets in the same positions. Perhaps the gaselier in one room has been fitted with three incandescent gas-burners giving nominally 40 to 50 candle-power apiece, or 150-candle power together—how sweet are these words to writers in the electrical press—"when new." The three-light electrolier which replaces it carries (say) three 8 or 16 candle power lamps, giving in all only 24 or 48 candles—when new. Yet, says the writer of the article, the consumer expects that 24 or 48 candle power will give him as good a light as the "alleged" 150-candle power of gas. The writer evinces bad form by allowing his jealousy and prejudice to come to the surface by the use of such terms as "alleged." All this points to the common discontent the electrical engineer has to meet when a gas consumer is coaxed over to a change to electric lighting. A consumer who has been enjoying lavish illumination finds it difficult to console himself by soft words, two-thirds of the light he formerly obtained, and at perhaps two-thirds greater expense. What is called "intelligent fitting" for electricity appears to be to have, instead of a room well supplied with light in every part, the fittings so disposed that light is used only where needed—the remainder of the room being in darkness.

After saying some rude things about "crude, inartistic, and inefficient" gas-fittings—yet the consumer complains of what succeeds!—the writer affects to show that, if a heavy cost is incurred in putting in plenty of points for electric lighting, with two-way switches about the place, and 2½ and 5 candle power lamps in lavatories, larders, and the minor passages, there will be an eventual economy. With plenty of points of lighting and switches about, the householder and his family will, it is assumed, find pleasure in switching off the light when not required, and only use those points that are absolutely requisite. Faith in human nature must be strong in this advocate of "intelligent" fitting. Our own opinion is that the more points of lighting there are about, the greater the opportunity for satisfying the craving for more light; and the result will be memorized by the account from the electricity supply offices. But this writer whose faith in the efficacy of his plans for producing the electricity consumer's contentment is so great, states that the overall result of following his directions is that electricity will work out as economically as gas when the consumption of bye-passes and mantle renewals are taken into account. To what a pass has come this competition between gas and electricity when the little pilot lights (now infrequently used), and mantle renewals, are the most poignant of the weapons that electricians can lay hands on. But notwithstanding that it is expected the result will work out as economically as gas, a little later we read that "it is unpardonable to keep [electric] lamps running when their light is not required; and the only excuse for such waste is the survival of ideas from the gas and oil ages." Therefore, the "economical" result of the sparing use of electricity is only shown by contrast with the big light of incandescent gas-burners and their wasteful use. Thanks.

The Metropolitan Asylums Board appear easily persuaded into spending large sums of money and into accepting the dogmatic assertions of officials without inquiry as to whether those officials have been sufficiently comprehensive in the investigation they have made to justify their conclusions. A report has recently been sent to the Board as to the lighting of the South-Western Hospital; but we do not see that any comparison was made by the officials of the relative advantages of electricity and modern incandescent gas lighting. It is considered by them that, by the adoption of electricity, there will be a better illumination of the wards; a saving on the annual expenditure for gas (this savours of comparison with the obsolete flat-flame gas-burner); hygienic conditions will be improved; and there will be lessened risk from fire. The Board have not got to the bed-rock truth on all these points. However an electrician may try to distort the figures, he cannot get the cost of electric incandescent lighting down to anything, light for light, approaching the cost of incandescent gas lighting; and, regarding the other points of the report of the Board's Medical Official, he cannot have had practical experience of the latest forms of incandescent gas-burners and fittings, or he would not have committed himself to such statements. As to fire risks, for example, he should consult the Coroner for the City of London, and compare the returns of the London County Council as to electricity and gas fires with the relative number of consumers. There is much of which he evidently has no knowledge at present. Reverting to the subject of cost, the installation expense for electricity is estimated at £4000; but how many public institutions can show actual installation costs that have been kept within the estimate? As to the annual cost of lighting public institutions, the Education Committee of the London County Council have been looking into the subject, and find the annual cost of the maintenance in the case of electric lighting comes out 50 per cent. higher than incandescent gas lighting; and we would guarantee that, even then, a considerably greater illumination would be afforded by gas. In the lighting of the Brownlow Hill workhouse at Liverpool, we read that the consumption of electricity for lighting has been "very much greater than was anticipated;" and this in public institutions, as with private houses, is the common experience.

Water Gas for Welding.—In the "Builders' and Contractors' Column" in the current number of the "Builder," reference is made to the value of water gas for welding. It is pointed out that, owing to the improvement of quality and the reduction of cost effected by the Dellwik-Fleischer process, water gas has been used of late far more than formerly in metallurgical work where high temperatures are required. It is worthy of note that this gas in burning generates heat of intensity sufficient to raise iron to welding heat, and consequently can be employed with advantage and economy for the welding of iron and mild steel. The use of the gas in substitution for the forge in welding iron plates enables work to be done more quickly and at lower cost in respect of both fuel and labour. From some figures given in "Stahl und Eisen," it appears that while the cost of welding plates 10 mm. (say 0·4 inch) thick is about 1s. per foot run with a forge where coke is used as fuel, the cost of welding plates of the same thickness by water gas is only 7½d. where hand labour is adopted, and 4⅛d. where special machinery is employed for pressing the edges of the plates together.

PERSONAL.

At the monthly meeting of the Board of the Wrexham and East Denbighshire Water Company, held on Tuesday last, Mr. John Rogers, the Deputy-Chairman, asked the Chairman, Mr. J. Allington Hughes, to accept a silver hot-water jug, privately subscribed for by the Directors, as a token of his brother Directors' appreciation of the excellent manner in which he had discharged the various tasks assigned to him in connection with the recent opening of the Ty Mawr reservoir, and, what was really of far more importance, of the respect and esteem in which he was held by his colleagues. He said it was a pleasure to work with the Chairman, who he hoped might long be spared to preside over their deliberations. The Engineer and Secretary (Mr. Fred Storr) expressed his pleasure in being permitted to join the Directors in making the presentation. Mr. Hughes, in acknowledging the gift, said he was much touched by the kindness of his colleagues in offering it, and by the remarks by which it had been accompanied.

OBITUARY.

HARRISON VEEVERS.

By the death last Tuesday morning of Mr. Harrison Veevers, of Dukinfield, a well-known figure has been removed from the ranks of gas engineers and managers, especially those whose duties are discharged in the Manchester district. He had been subject to bronchial attacks, and had latterly been under medical care; but he was not seriously ill till about three weeks ago.

Mr. Veevers was born at Thurnham, near Lancaster, on Aug. 13, 1832; so that he was in his 76th year. He commenced his business career with Mr. John Rofe, the Engineer of the Preston Gas-Works, under whose supervision he prepared plans and superintended the erection and alteration of works in various parts of the country. On Mr. Rofe relinquishing practice in 1857, Mr. Veevers went to Carlisle, where he entered into partnership with Mr. H. H. M'Kie, the City Surveyor. Ill-health compelled him to leave the city; and in 1858 he obtained the position of Engineer and Manager of the Warrington Gas-Works, retaining it till the end of January, 1862. His next move was to Colombo, where for nearly two years he was engaged in constructing the Colombo and Kandy Railway. His health being seriously affected, he returned to England, and was appointed Manager of the Bolton Gas-Works—a position he held for fourteen years. He resigned it, however, and in 1879 was appointed Engineer of the gas-works of the Dukinfield, Denton, and Haughton Joint Gas Committee. On the dissolution of the Committee, he was offered, and accepted, the joint positions of Surveyor to the Dukinfield Local Board and Engineer, Manager, and Secretary of the gas-works. After a time he relinquished the former position, but retained the latter till June, 1905, when he was appointed Consulting Engineer.

Mr. Veevers was admitted into the British Association of Gas Managers in 1865, and passed successively into the Institute and the Institution. He was upon the Council of the Institute at the time of the division in its ranks, and in 1888 was elected to the office of Vice-President—a position to which he was re-elected in 1890, and was Senior Vice-President for 1891-2. He did not pass to the presidency, which was taken by the late Mr. Denny Lane, of Cork. He was one of the founders of the Manchester District Institution of Gas Engineers, was one of its first Presidents, and for a short time was Honorary Secretary—being succeeded in the last-named office in 1889 by Mr. S. S. Mellor. He was the author of two papers read before the Gas Institute—viz., "Testing Coal and Cannel" and "Sulphate of Ammonia Manufacture;" and before the Manchester District Institution he read papers on "Collecting Gas Accounts," "Naphthalene," "Mains and Services," and "The Use of Oxygen in the Purification of Coal Gas." Mr. Veevers had been an associate member of the Institution of Civil Engineers since 1874, and was a member of the Incorporated Association of Municipal Engineers.

With regard to Mr. Veevers' work at Dukinfield, it may be mentioned that when he went there in 1879 the cost of making and distributing gas was 4s. 1·80d. per 1000 cubic feet, and that in 1899 it was 2s. 9·33d.—showing a decrease of 1s. 4·47d., or at the rate of 33 per cent. The unaccounted-for gas in the former year was nearly 30 millions, or 30 per cent. of the make; whereas in the latter it was only 7½ millions, or 13·33 per cent. During his occupancy of his position he entirely remodelled the works; so that few, if any, of the original buildings remain. As Surveyor he did equally good work for the town.

Mr. Veevers was a Freemason, having been admitted a member of the craft in 1859. He had been W.M. of Lodge Fidelity, No. 430, was one of the founders of the Northern Star Lodge, East Lancashire Province, of which he was Treasurer, and up to his death was a Knight Templar. In every town in which he resided, he took a very active part in literary matters, particularly in the establishment of public libraries; and he compiled a new catalogue of the books in the Dukinfield Free Library. He also possessed considerable artistic ability. He was a member of the Manchester Literary Club, and a Fellow of the Manchester Geographical Society.

Mr. Veevers was twice married; and he leaves a widow, three sons, and two daughters. His sons are Mr. James M. Veevers, Engineer, Manager, and Secretary of the Rochester Gas Company, Mr. C. Foster Veevers, the Manager and Secretary of the Northfleet Gas Company, and Mr. Harrison Veevers, who is in the Surveyors' Department of the Lancashire and Yorkshire Railway Company. The interment took place last Friday afternoon, in the Friends' Burial Ground, Ashton-on-Mersey, and was attended by many personal friends and business connections of the deceased. The Manchester District Institution were represented by the Vice-President (Mr. Tim Duxbury, of Oldham), the Hon. Secretary (Mr. H. Kendrick, of Stretford), and Messrs. W. S. Haddock (Warrington), J. E. Lamb (Altrincham), and C. Potts (Hyde); the Northern Star Lodge, by Mr. S. Meunier (Stockport), S. S. Mellor (Northwich), Thomas Duxbury, and J. R. Lee; and the Dukinfield Corporation by the Mayor (Mr. J. Cooke, J.P.) and the Town Clerk (Mr. T. H. Gordon, B.A.).

CITY AND GUILDS OF LONDON INSTITUTE.

The Examinations in "Gas Manufacture."

We have received from the Superintendent of the Department of Technology of the City and Guilds of London Institute (Sir Philip Magnus, M.P.) the report on the work of the department during the past session. We extract from it a few general particulars, as well as those relating to the examinations in "Gas Manufacture," in which our readers are more specially interested.

In the last examinations in technology, 21,728 candidates were presented from 439 centres in the United Kingdom; and of these 13,054 passed. By including the candidates from India and the Colonies, and those for the teachers' certificates in manual training and domestic economy, the total number of examinees was 23,572, compared with 22,147 in the session 1905-6. The number of subjects in which examinations were held was the same as before; but the number of separate classes increased from 2820 to 3311, which is the largest on record. There was also a marked increase in the number of students in attendance; it having risen from 44,468 to 46,048. The proportion of students who presented themselves for examination and the percentage of passes, both of which showed a fall in 1905-6, were last session the same as in 1904-5. The number of candidates' papers was 21,728, and the number of passes 13,054. In the engineering industries, the numbers continue to increase. In mechanical engineering, there were 2349 registered students and 1715 candidates, against 2302 students and 1532 candidates before. In electric lighting there was a marked fall. In the Honours grade in this subject, however, the percentage of passes was distinctly more satisfactory than for several years past; but in the Ordinary grade and preliminary examinations there were more failures. In "Coal Tar Distillation" and "Coal Tar Products," in which for the future only one examination will be held, 31 candidates went up for examination, of whom 2 passed first-class in the Honours grade, 4 in the same class in the Ordinary grade, 5 in the second class, and 20 failed, or 64·5 per cent. The programme for the current session was issued in July, and noticed in our columns at the time. Some reference has been made to the division of the subject of "Gas Manufacture" into "Gas Engineering" and "Gas Supply;" and in the "Journal" for the 4th of June last (p. 650) we gave the syllabuses for the examinations in the two grades.

Turning to the tables showing the results in the separate subjects, the report shows that in "Gas Manufacture" there were 32 registered classes, with 434 students in attendance, 356 candidates at examinations, and 236 passes last year, compared with 29 classes, 548 students in attendance, 438 candidates, and 323 passes the preceding year. In the Honours grade, 46 passed in the first class, 59 in the second class, and 38 failed; while in the Ordinary grade the passes were 55 and 76 respectively, and the failures 82. There were consequently 236 passes and 120 failures, or 33·7 per cent., compared with 323 passes and 115 failures, or 26·2 per cent., in the year 1905-6. Of the total number of students in "Gas Manufacture," 46 attended classes at the Regent Street Polytechnic, which are conducted by Mr. Walter Grafton, F.C.S. Of these, 38 went up for examination and 27 passed—14 in the Ordinary and 13 in the Honours grade—and two were prize winners. Two candidates went up from the Battersea Polytechnic, and both passed—one in each grade.

Reporting upon the work of the students, the Examiner (Mr. A. F. Browne, of Vauxhall) says the results of the last examinations differed materially from those of the preceding year. Those in the Ordinary grade showed a marked falling off; there being an increased percentage of failures, and 12·5 per cent. of the candidates obtaining less than 25 per cent. of the marks. Mr. Browne adds that their papers conveyed the impression that "the writers had not experienced the advantages attaching to instruction by qualified teachers." The second-class papers were fair, and the first-class ones satisfactory—not a few being remarkably good. In the Honours grade, on the other hand, there was an all-round improvement. The second-class papers were good, and those in the first class excellent. In both grades, the papers of the prize winners were "deserving of high commendation."

In the "Journal" for the 30th of April, we gave the papers set in the two grades; and the names of the successful candidates were published in the number for June 25—those of the prize winners being given in the issue for Aug. 13.

A PROGRESSIVE GAS COMPANY.

Interesting Features in Turin.

A SHORT paragraph recently in the "JOURNAL" gave a few figures relating to the past year's working of the Consumers' Gas Company of Turin, Italy. As usual, their last annual report presents some interesting features; and therefore we give a few further particulars of this progressive Company, with one or two illustrations of their plant. The works, it may be called to mind, have during the past few years been very largely reconstructed; important extensions being designed and begun by the late Manager, Signor Luigi Beria, and now carried on, and all but completed, by his brother and successor, Signor Giacomo Beria.

It was about a year ago* that we fully referred to these extensions, and gave illustrations of the new naphthalene washers and the purifying plant. The latter, in a new house, has now been entirely finished, and we supplement former photographs with one (fig. 1) showing in some detail the internal arrangements of the purifier building. In particular, the method adopted of using the travelling crane to support a single track for the trolleys or skips used for loading and unloading the purifying material will be noted. Other work completed is the rebuilding of a bench of six beds of retorts, which have given complete satisfaction, especially in regard to their heating and fuel consumption. This is particularly noteworthy, for the fuel used was exclusively coke dust mixed with coal. To keep pace with the demands, however, yet another retort-bench will have very shortly to be undertaken; and also a new gasholder of 30,000 cubic metres (1,060,000 cubic feet) capacity is urgently required. Other apparatus completed last year consisted of ammoniacal liquor plant, and station governors, which in both cases were supplied by German manufacturers. These governors, combined with a new virgin main, 600 mm. (24 inches) diameter, which has been laid, will ensure uniform distribution of pressure throughout the city. During the year, 8583 metres (9386 yards) of mains were laid; bringing the total mileage up to 181. The leakage remains about the same—namely, 6 per cent. of the quantity produced.

During 1906-07, there was an increase in the gas consumption of 10·87 per cent.; the total amounting to 16,730,548 cubic metres, or about 590 million cubic feet. This works out at 534 cubic metres (18,850 cubic feet) for each consumer's meter, or about 86 cubic metres (3036 cubic feet) of gas consumption per head. Though this last figure is the best in all Italy, it is far below the consumption per head given for other cities, for example:

	Cubic Metres.		Cubic Feet.
Cologne	93·50	=	3300
Zurich	94·50	=	3335
Paris	130·00	=	4591
Charlottenburg	141·00	=	4980
London	170·00	=	6004

It is somewhat difficult, perhaps, for an English gas manager, with a colliery practically at his door, to realize the anxiety that his colleague must at times feel in a country without coal, and where he is dependent upon more or less uncertain supplies by sea or rail. Such anxiety is of necessity emphasized in times of strike, high prices, and railway disorganization. The two latter features have been much in evidence during the past year. The price of coal in July, 1906, was 16s. c.i.f. Savona. It gradually went up to 22s. in May last, and then came down again to 20s. 9d. and 20s. 6d. In addition to this, as is well known, the railway service, partly through the Italian Government taking over the administration, has been in hopeless confusion and helplessly inadequate. The combined result was that at Turin the Consumers' Gas Company had only 2000 tons of coal left them in April last. With improving weather, the conditions became better, and the Company accumulated 6000 tons of American and 14,000 tons of English coal, The high quality of the former, supplied by the Westmoreland Coal Company, serves as a stand-by in case of pressing need. In the year ending June 30 last, 55,856 metric tons of coal were carbonized, producing 17,944,650 cubic metres (about 633 million cubic feet) of gas. This represents 32·2 cubic metres of gas per 100 kilos, of coal carbonized, or a make of about 11,550 cubic feet per ton. We believe this to be the highest make we have seen recorded.

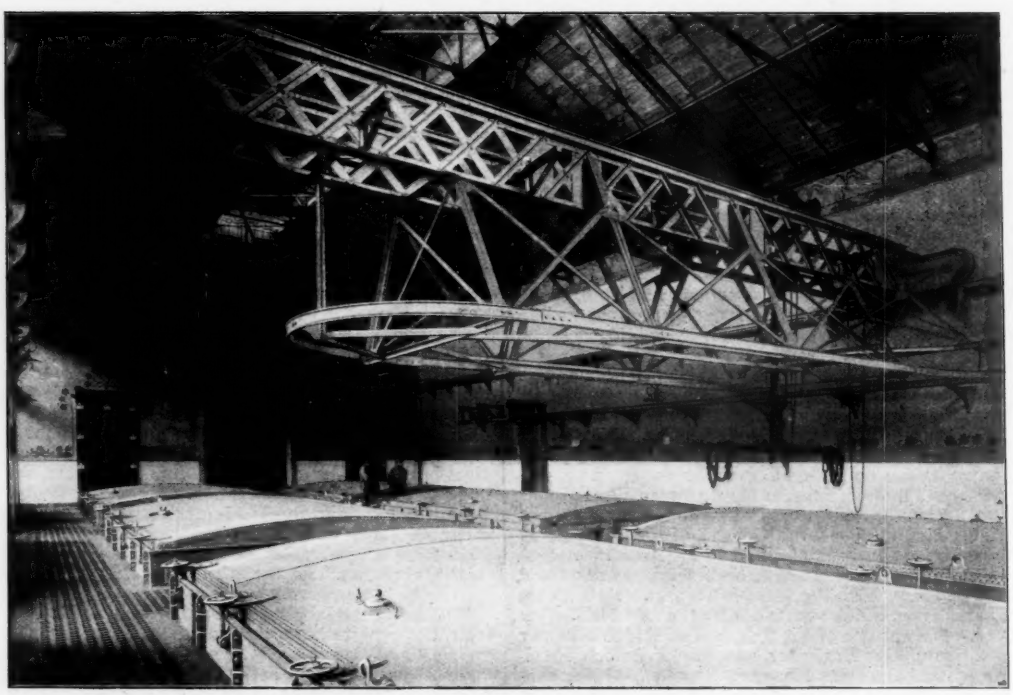


Fig. 1.—Travelling Crane, carrying the Track for the Purifying Material Skips.

Although coal is dear in Italy, there is the compensating advantage that coke also fetches a high price. The demand often exceeds the supply; so much so that at Turin the Gas Company have restricted the supply of it only to their gas consumers, to the exclusion of others. Moreover, so as to have as much coke as possible available for sale, a machine (illustrated fig. 2) has been installed for the manufacture of briquettes made out of coke dust and waste. These briquettes have been successfully used as fuel in the producers. For the quick and punctual delivery of coke orders, an electric motor waggon has been brought into use, with very satisfactory results.

In last year's report, the relationship of the Gas Company with the municipal authorities was referred to, especially as regards litigation on the question of the legality of the Municipal tax of 3 centimes per cubic metre of gas (equal to about 8d. per 1000 cubic feet). The right to impose such taxation, in addition to a Government tax, has now been upheld by the Court of Appeal, and, though disappointed at the result, the Directors of the Company have reluctantly decided not to appeal further. With regard to the danger of municipalization, this has now apparently blown over, and the proposal has been abandoned by the town authorities.

In the year 1911 will be celebrated the first "*cinquantenario*," or fifty-year anniversary, of the royal proclamation which on March 17, 1861, gave Victor Emmanuel the title of King of Italy, and raised his country to the dignity of an united nation. In honourable remembrance of this event, an industrial and international exhibition will be held in Turin; and with a view to securing its adequacy, the Consumers' Gas Company have taken up shares to the amount of lire 50,000 (£2000). Is not this an example that might be followed—no doubt in varying degrees

* See "JOURNAL," Vol. XCVI., p. 380.

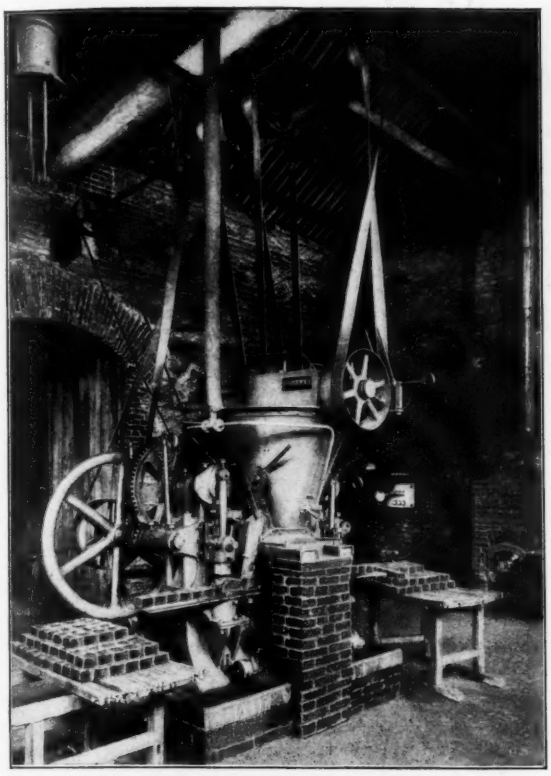


Fig. 2.—Machine for Manufacturing Briquettes.

and under different circumstances—by British gas companies in connection with other exhibitions ?

Such is the record of progress and of technical and commercial activity of one of the two Gas Companies responsible for gas affairs in the capital city of Piedmont. We are interested in their work, and congratulate the President, Signor Gioachino Fornas, and the Manager, Signor Giacomo Beria, upon the successful result of the year's labours.

WATER ACTS FOR 1907.

SECOND ARTICLE.

IN the last number of the "JOURNAL," we noticed the Acts obtained last session by Water Companies. We now deal with those of Local Authorities which contain provisions in regard to water supply.

The Ashton-under-Lyne, Stalybridge, and Dukinfield District Water-Works Joint Committee have, by their Act, been granted an extension of the period limited by the Act of 1870, under which the Committee were constituted, as amended by subsequent Acts, for the completion of such of the works thereby authorized as have not been carried out, to ten years from the passing of the Act, so far as the Chew reservoir is concerned; and in respect of the other works, to the time when they will be required. The Committee are to take steps to construct the reservoir and complete it within the period named. Their powers in regard to the protection of water from pollution are strengthened. The contributions of the authorities constituting the Committee towards the expenses of the joint undertaking are to be increased as may be required for the purposes thereof, up to certain sums specified. [*Parliamentary Agents: Messrs. Sharpe, Parker, and Co.*]

The Birkenhead Water Act empowers the Corporation to obtain a supply of water from the Rivers Alwen and Brenig, in the county of Denbigh. The scheme, as our readers may remember, is a very extensive one. The works comprise two impounding reservoirs in the above-named county, reservoirs or tanks in the counties of Denbigh, Merioneth, Flint, and Chester, and various aqueducts or pipe-lines. The Alwen reservoir, the first line of pipes, with the accessory tanks and tunnel for conveying water to the borough, are to be completed within ten years from the passing of the Act. The Corporation are authorized to appropriate the waters of the two rivers named and their tributaries, and such other streams, springs, and waters as will or may be intercepted by the works; but before commencing to use any of it they are to provide compensation water in the quantities specified. The Act contains most extensive provisions for protecting the Corporation of Liverpool and the various county and local authorities, private parties, and companies likely to be affected by the works authorized; the sections in regard to this matter occupying about eighty pages of the Act. The Corporation may supply water in bulk to local authorities, companies, or persons; but the price to be charged to the two former is to be such sum per 1000 gallons as shall not exceed by more than 10 per cent. the average payable in the borough of Birkenhead. Power is given to the Corporation to raise for the purposes of the scheme £1,340,000, which is £410,000 less than they asked in the Bill. Under this, however, three impounding reservoirs in Denbighshire were proposed. The Corporation are not to raise more than £800,000 of the total until the Alwen reservoir and the pipe-line for conveying water therefrom to Birkenhead, together with the accessory works, have been completed, and the contract for the construction of the Brenig reservoir has been let. The money is to be obtained by the issue of Corporation stock or by mortgage. As from the 29th day of September last, the maximum charge for water used for domestic purposes is raised from £6 10s., the figure contained in the Corporation Act of 1881, to £12 10s.; but provision is made for granting, under conditions specified, a rebate to owners and occupiers of all rateable hereditaments in the Oxton and Bebington wards of the borough. Water supplied to shipping is not to be charged for at a price exceeding 2s. 6d. per 1000 gallons in excess of the amount charged for water supplied for trade purposes within the Corporation's area. Works below high-water mark are not to be commenced without the consent of the Board of Trade. [*Parliamentary Agents: Messrs. Sherwood and Co.*]

The Birmingham Corporation Water Act amends certain provisions of the Corporation Water Acts relating to the repayment of moneys borrowed for the purposes of these Acts. The new Act is short, consisting of only the preamble and three clauses, of which the second is the most important. It sets forth that in the case of all moneys borrowed by means of Corporation stock created and issued or transferred for the purposes of the Acts of 1892, 1896, and 1902, and outstanding on March 31, 1906, and in the case of all moneys borrowed on mortgage or bills for the purposes of the Acts outstanding on the date named, it shall not be obligatory upon the Corporation to commence payments into the loans fund of annual sums for the redemption of such stock, or to create any sinking fund, until the expiration of sixteen years from the date of issue or transfer of the stock or of the borrowing on mortgage or bills. The Act is not to impair or affect the obligation of the Corporation to make provision for the redemption of stock, and to repay moneys borrowed on mortgage or bills within the period of sixty years mentioned in sections 68 and 69 of the 1892 Act. [*Parliamentary Agents: Messrs. Sharpe, Parker, and Co.*]

The Broadstairs and St. Peter's Urban District Water Act authorizes the Urban District Council of Broadstairs and St. Peter's to construct additional water-works, and confers on them further powers in relation to their water undertaking. The works, which are less extensive than those specified in the Bill, which included a well and pumping-station at Eastry, comprise a pipe-line commencing at the existing Fleete reservoir, in the parish of Garlinge, passing through St. Lawrence Extra, and terminating in a pipe-line which will end in a tower and tank to be situated in the parish of St. Peter Extra. The works are to be completed within two years after the passing of the Act. The maximum charge for water for domestic purposes is to be £7 10s. per cent. per annum upon the gross estimated rental of the premises supplied, compared with £8 15s. in the Bill. Power is given to borrow £12,100 for the purchase of land and the execution of the works; £5000 for new mains, extensions of mains and service-pipes, and meters; the sum needed to defray the expenses incidental to obtaining the Act; and, with the approval of the Local Government Board such further amount as may be wanted in connection with the water undertaking. The money required for the works and mains is to be repaid within thirty years from the time of borrowing it; that raised to obtain the Act, within five years from the date of the Royal Assent; and the rest, within such period as the Local Government Board may name. [*Parliamentary Agents: Messrs. Lees and Butterworth.*]

The Coventry Corporation Water Act is mainly to authorize the Corporation to obtain a supply of water from the Whitacre pumping-station of the Birmingham Corporation at Shustock, which is to be connected by a line of pipes with a tank adjoining the southern of the two existing service reservoirs of the Coventry Corporation at Coundon. The works are to be completed within five years from the passing of the Act. The Birmingham Corporation are to furnish a supply of water for sixty years at the rate of 4d. per 1000 gallons, subject to a minimum rate of £1250 per quarter, entitling Coventry to a minimum quantity of 75 million gallons in that period. The supply of water is to be given and taken within three months after the completion of the aqueduct and the meter and subsidiary works connected with it. The water to be supplied is that drawn by the Birmingham Corporation from the River Bourne; but provision is made for a supply from the Corporation's Welsh works, should they be called upon by Coventry to furnish it. In the event of the Meriden Rural District Council by notice requiring water for the parishes of Maxstoke and Great Packington, the Coventry Corporation are to sell them by meter not more than 10,000 gallons in any one day, at the rate of 8d. per 1000 gallons, with an additional charge of £3 10s. per annum for each meter employed at the points of delivery. The charges for water for domestic purposes are based upon the rateable value of the premises supplied; but the Corporation may sell by measure at a maximum price of 1s. 6d. per 1000 gallons, and may also sell or let meters. Authority is given for the borrowing of £32,400 for the purchase of lands and the construction of the service-tank; £48,600 for the line of pipes; and the amount required to defray the expenses of the Act. The

first-named sum is to be repaid within sixty years and the third within five years from the passing of the Act, while thirty-five years from the date of borrowing are granted for defraying the cost of the pipe-line. Any further money must be raised with the sanction of the Local Government Board, and be repaid as they specify. [*Parliamentary Agents: Messrs. Sharpe, Parker, and Co.*]

By the Devonport Corporation Water Act, further powers are conferred upon the Corporation in respect of their water undertaking. They are authorized to lay down a line of pipes commencing at Walkhampton, at a service-tank to be constructed there, and terminating near the existing reservoir at Tamerton Foliott; another line commencing at Egg Buckland, and also terminating at Tamerton Foliott in a reservoir to be built; and a filter-bed in the same parish, adjoining the Crownhill filter-beds of the Corporation. The works are to be completed within five years after the passing of the Act, or such further period as may be sanctioned by the Local Government Board. As from the 1st of October last, section 19 of the Corporation Act of 1902, relating to water-rates for domestic purposes, is altered, and the charges are based upon the gross estimated rental of the premises supplied, as set out in the Act. Section 70 of the General Act of 1847 is also altered so that the dates of payment shall be the first day of each quarter of the year, instead of the usual quarter days. The Corporation are empowered to make bye-laws for preventing the pollution of the water. Authority is given for borrowing, for the purchase of lands and easements and the construction of the service-tank, reservoir, and filter-bed, the sum of £39,000; for the construction of the pipe-lines, £22,000; and for lining portions of the existing leat, £11,000; together with such further amount as the Local Government Board may sanction. The first-named sum is to be paid within sixty years, and the second and third within forty years, from the date of borrowing; while the last is subject to the order of the Local Government Board. [*Parliamentary Agents: Messrs. Sherwood and Co.*]

The Heywood and Middleton Water Board Act confers further powers upon the Board with respect to their water undertaking. They are authorized to borrow for the purchase of land and for defraying the excess of expenditure required for the completion of the Ashworth Moor enlarged reservoir and other works sanctioned by their Acts of 1877 and 1901, the sum of £103,000; for constructing filter-beds, £5000; the money necessary for paying the costs and expenses of the Act; and such further amount as the Local Government Board may sanction. The first two sums are to be repaid within sixty and thirty years respectively from the date or dates of borrowing; the third, within five years after the passing of the Act; and the last, in such time as the Local Government Board may specify. [*Parliamentary Agents: Messrs. Sharpe, Parker, and Co.*]

The Keswick Urban District Council (Water) Act describes and sanctions the existing water undertaking of the Council, authorizes the construction of works, and defines the limits of supply. The new works comprise a line of pipes commencing at a point in a pipe coming from the intake on the Whit Beck, and terminating in the existing Millbeck reservoir, and a covered reservoir adjoining the one just named. The limits within which the Council wish to supply water are fully defined in the Act. The charge for water for domestic purposes is to be on the rateable value of the premises; and where the supply is by measure, the price is not to exceed 1s. 6d. per 1000 gallons—supplies in bulk beyond the limits to be furnished on terms and conditions to be agreed upon. The Council are empowered to borrow any sum not exceeding £8400, to be repaid within fifty years from the date of borrowing. Separate accounts are to be kept in respect of the moneys raised for the water-works undertaking. [*Parliamentary Agents: Messrs. Dyson and Co.*]

The Leeds Corporation Act sanctions (*inter alia*) the construction of additional water-works and the abandonment of certain others. The latter include the Colsterdale reservoir, a portion of an aqueduct, a pipe-line, and two road diversions sanctioned by the Corporation Water Act of 1901; and any damage done in respect of them is to be compensated for. The new works consist of a reservoir in the parishes of Healey-with-Sutton and Colsterdale, to be called the "New Colsterdale Reservoir;" an aqueduct commencing in the one of which a portion is to be abandoned, and terminating in the new reservoir just referred to; a covered service reservoir in the township of Armley and Bramley, and another in the township of Holbeck; and various conduits or pipe-lines and a road diversion. A period of nine years is granted for the completion of these works; and the time specified for carrying out those authorized by the Act of 1901 is extended till the expiration of five years from Aug. 17, 1911. The Act named is amended in regard to the supply of compensation water. On the completion and filling of the new Colsterdale reservoir, the quantity furnished is to be 2,578,853 gallons per day; on the completion and filling of the Leighton reservoir, it is to be 2,308,563 gallons per day (this quantity being inclusive of the compensation water which the Harrogate Corporation are required to discharge from their Roundhill reservoir); and on the completion of two catchwaters specified, the further quantity of 696,483 gallons per day is to be given. The Act is also amended, in the section relating to compensation, by the substitution of the Board of Agriculture and Fisheries for the Board of Trade. The Corporation are authorized to apply for or in connection with the purchase of land and the execution of the works specified any moneys borrowed or to be borrowed under the Act already mentioned. [*Parliamentary Agents: Messrs. Sharpe, Parker, and Co.*]

ALCOHOL FOR LIGHT AND POWER.

THE prophecy of Professor Lewes, referred to in last week's "JOURNAL" (p. 480), as to the future of alcohol, "to which posterity will have to turn for a fuel," is, of course, one that has frequently been made before. As regards the use of alcohol for lighting purposes, M. Théodore Vautier, in his presidential address to the Société Technique du Gaz, in the year 1899—dealing with photometry and secondary standards of illumination—described the alcohobenzol lamp designed by M. Blondel, improving the Hefner lamp. M. Vautier also read a paper before the same congress, on "Incandescent Lighting by Mineralized Alcohol," in which he made a very careful calculation of the calorific power of alcohol. He showed that the heating value of one litre of mineralized alcohol was rather less than that of one cubic metre of coal gas; and that, therefore, the price of the former would have to be a little lower than the latter for it to compete. At the same meeting, M. Syssoyeff in a paper on "Gas and Its Competitors, Past, Present, and Future," referred to what we may perhaps term incandescent alcoholic lamps, and the state of practical efficiency to which they had been brought in Germany, where alcohol was at a very low price.

To the International Gas Congress of 1900, the late M. Lecomte contributed a long and valuable paper* on "Illuminating Competitors with Gas," in which he dealt at length with alcohol as a source both of light and power. In a later paper† on the same subject, M. Lecomte said: "The attention of gas makers was first drawn to mineralized alcohol by M. Th. Vautier, and was further studied by M. Ph. Delahaye in 1887. At the present time [1902], alcohol is a practical source of light and heat; and the chief thanks for the extraordinary industrial development of its application in these particulars must be given to M. Jean Dupuy, who inaugurated the mineralized spirit in France. It is to the interest of the gas industry to favour the production of alcohol; for, as with an average beet crop, a hectare (2·47 acres) of land produces from 28 to 30 hectolitres (616 to 660 gallons) of alcohol, and as an expenditure of 130 kilogrammes (286 lbs.) of sulphate of ammonia is required for this area of land, it follows that for every hectolitre of alcohol produced, 5 kilos of sulphate are sold." M. Lecomte proceeded in his paper to describe various incandescent lamps for alcohol, and came to the conclusion that they had not yet reached their limit of efficiency.

Turning now, briefly, to the use of alcohol for power and motor purposes, M. Lecomte pointed out in his 1900 paper above referred to, that if petrol be replaced by alcohol in a motor carburettor, one would not get very far, unless the motor-engine was already hot. This was simply because alcohol is less dangerous than petrol, and only gives off inflammable gases at 18° C. above zero. For alcohol to be used for driving purposes, resource must be had to tar benzine; and thus the bye-products of gas-works are called into use. The cost will not be any higher than using petrol; and there is the great advantage that no smell will be given off. In this connection, a paper, on the alcohol motor, read last month by M. Emile Barbet, the President of the Fifth (or Gas and Chemical Industry) Section of the French Society of Civil Engineers, may be referred to. In France, the subject has attained the dignity of a Congress on Alcohol; the first having been held in 1903. The question of the use of alcohol and benzine is now a really practical one. M. Barbet proposed in 1903 the use of mineralized alcohol in large towns, as it gave off no smell. When mixed with benzine, the latter should be freed of its sulphur, as was required to be done with illuminating gas. Alcohol was the carburant of the future.

The dictum of Professor Lewes, therefore, that "the sooner . . . the full force of experiment is turned on to the problems of the alcohol motor, the better," seems to be a view that is shared by others; and inasmuch as it may have important reflex effects upon the gas industry and its bye-products, it is important to keep in touch with the progress made.

* See "JOURNAL," Vol. LXXVI., p. 955, Oct. 16, 1900.

† *Ibid.*, Vol. LXXX., p. 36, July 1, 1902.

The International Lighting and Heating Exhibition in St. Petersburg.—In the "JOURNAL" for the 8th ult., we noticed the proposal to hold this exhibition. Dr. Paul Dvorkovitz, of No. 45, St. Mary Axe, E.C., Honorary English representative of the exhibition, asks us to draw attention to the fact that there are now only a few weeks left in which English manufacturers of lighting or heating appliances can secure space. Inasmuch as the exhibition, which opens on the 28th of January next, is to be international in character, every effort has been made to induce foreign exhibitors to give it their support; and we learn that, up to the present, France, Germany, and Belgium have come well to the front. On the Russian railways, all exhibits which pay freight to the exhibition will be allowed to return free of charge; while similar arrangements are to be made all over the French, Austrian, and German lines. English exhibits will pass the frontier without Customs examination (which will take place inside the exhibition), and they will, moreover, be imported into Russia duty free. Dr. Dvorkovitz will be pleased to give whatever other information may be desired. The exhibition will remain open for one month.

THE LIGHTING OF THE PLYMOUTH TRADES EXHIBITION.

Victory of Gas.

A YEAR ago, attention was called through the "JOURNAL" to the very attractive display made by the Plymouth and Stonehouse Gas Company at the Trades Exhibition held at Plymouth. The Exhibition is an annual one, and has been held for eight or ten years in succession. Until a year ago, the lighting was done entirely by electricity; but when the Gas Company joined the ranks of the exhibitors, their stalls and the immediate surroundings were, of course, lighted by gas. Whatever may have been thought of the other exhibits, it is certain that the Gas Company's was not the least attractive display; while the lighting effect so pleased the Directors of the Exhibition that they decided to place the contract for the lighting of the building this year in the hands of the Gas Company. The result is that, for the first time in the history of the show, gas has the field entirely to itself. All the lighting, both of the avenues and the stalls, is done by gas; while outside the building there are also several powerful gas-lamps. In the general opinion, the lighting has never been so brilliant as it is this year; and though the management have not made any public statement regarding the cost, it is safe to say that it has

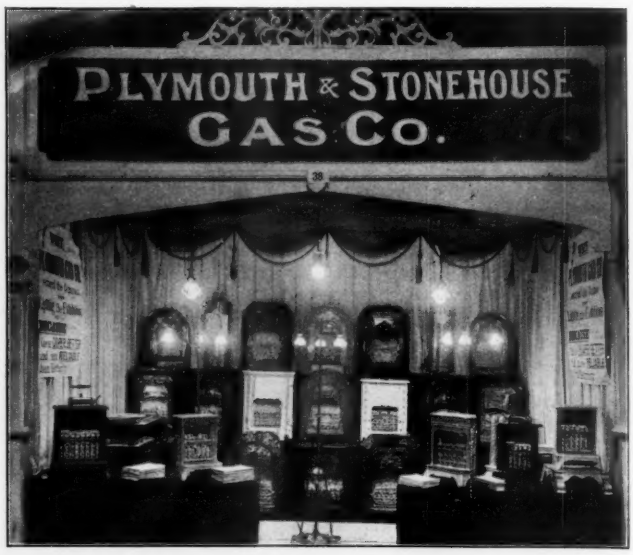
The Gas Lighting of the Exhibition Hall.

never been carried out more economically. As the attendance of visitors will probably reach nearly 100,000 in the three weeks the Exhibition will be open, gas lighting should obtain one of the best advertisements that it has had in the south-western counties in recent years.

The building is the Drill Hall of the Plymouth Volunteers—a plain, unattractive, spacious structure, with no architectural features whatever. In the arrangement for its present purpose, the stalls are so placed as to open on two main avenues running practically the whole length of the building, with cross passages at intervals. There are also spaces under the galleries and in other odd corners in which various side-shows are held. For the main lighting of the avenues, there are used about 50 Welsbach self-intensifying lamps, each of 300-candle power. These are admirably spaced; and the light is so equally distributed as to leave no suggestion of shadow or dimness. Over the gallery at the west end, which is set apart for the display in a bread-making competition, which is one of the features of the Exhibition, there are hung one 600-candle and two 500-candle Edgar lamps. All the stalls are fitted alike with Graetzin patent inverted burners, which are also used for the lighting of the Arts and Crafts Section. In the photographic department, "Bijou" burners of the New Inverted Incandescent Gas-Lamp Company's manufacture are employed. As opal globes have been used throughout, the lighting generally is soft and pleasant to the eyes. There is no suggestion anywhere of glare; and, on the other hand, there

are no dark spots or indications that one place has received less attention than another in the matter of illumination. The main approach to the building is effectively illuminated by four Edgar lamps of 500-candle power each. All the work has been carried out by the Gas Company's town staff, under the supervision of the Engineer, Mr. Percy S. Hoyte; and both in design and in execution it is very creditable. Though it has only to serve a temporary purpose, the work has been as substantially and thoroughly done as if meant to be permanent.

A few words may be said about the Company's own display at one of the stalls. Though on a less ambitious scale than last year, the show is very effective. In includes a number of patterns of gas-fires, by Messrs. Fletcher, Russell, and Co., Messrs. Wilsons and Mathiesons, the Richmond Gas Stove and Meter Company, and others, many of which are finished in "porcellanite" enamel of different colours. There are also some samples of the cookers made for the Company, some thousands of which are now in use on the hire system. Two or three gas-geysers—including one of Maughan's new "Teba" patent and Ewart's latest pattern—are also exhibited; and there are a number of specialities, including Messrs. Wilsons and Mathiesons' ingenious lock for gas-fires and a pneumatic distance gas-lighter. The latter is connected with the lights by which the stall is illuminated. These include three drawing-room standard lamps, each fitted with three of Bray's inverted burners with opal globes and coloured frills; while hanging from the ceiling are three single inverted gas-burners. Though presenting no uncommon feature, the display is bright and pleasing, and attracts the notice of visitors.



The Gas Company's Stand.

Another View of the Exhibition.

In connection with the Gas Company's stand, attention may be called to a large poster, copies of which are displayed on the stall and on the walls in the town, drawing attention to the fact that the lighting of the exhibition is done by gas, and enforcing the lesson. "Why," asks the poster, "has the Plymouth Gas Company secured the contract for lighting the Exhibition this year?" and then follows the answer: "Because it has been found that gas is cheaper, better, and more reliable than electricity."

According to a contemporary, a cement that will resist even white heat may be made of pulverized fire-clay 4 parts, plumbago 1 part, iron filings or borings free from oxide 2 parts, peroxide of manganese 1 part, borax ½ part, sea salt ½ part. Mix these to a thick paste, and use immediately. Heat up gradually when first using.

SECURING UNIFORM MIXTURES OF COAL.

The efficient working of systems of mechanical retort-stoking is sometimes interfered with by the coal employed being composed of an irregular mixture of large and small. If a retort is charged in certain places with lumps and in others with small coal, the former parts are very considerably superheated, on account of the kind of coal in contact with them distilling more rapidly than the small. The effect of this superheating is dissociation of the heavy hydrocarbons liberated by the small coal, and rapid deterioration of the surface of the retort. It is therefore advisable to charge retorts with coal consisting as nearly as practicable of an equal mixture of lumps and small. For ensuring this, an arrangement has been patented by the Dessau Vertical Retort Construction Company and it was described and illustrated in a recent number of the "Journal de l'Eclairage au Gaz et à l'Electricité," from which the following particulars have been taken.

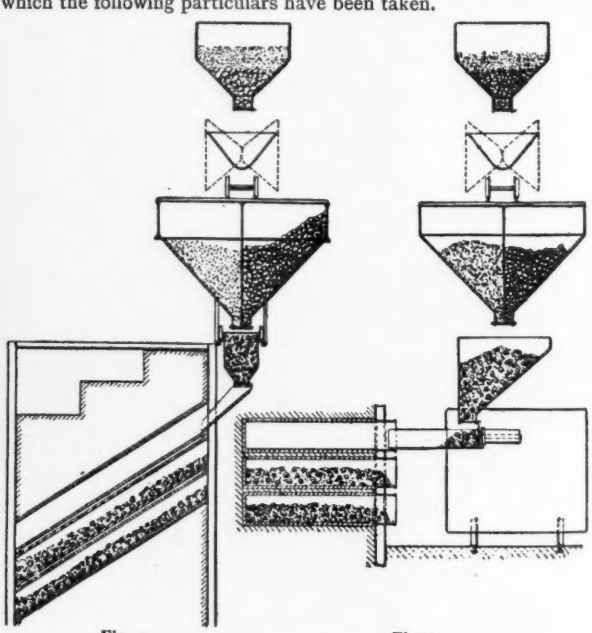


Fig. 1. Fig. 2.

In the accompanying diagrams, the arrangement as applied to inclined retorts is shown in fig. 1, and to horizontal retorts in fig. 2. The illustrations are almost self-explanatory. The coal is loaded into a small distributing truck, from which it is discharged into a large double-chambered hopper, one division of which receives the small and the other the lump coal. Below the hopper is a mixing receptacle, movable on rails, into which the coal falls, on the sliding doors at the bottom of the hopper being opened, in a uniform mixture, which can be regulated as desired. It can then be passed down the shoot, in the case of inclined retorts, and be distributed evenly over the surface of the retort. For horizontal retorts, as will be seen, the mixing receptacle, which is different in shape, is located at the upper part of the charging-machine, and from it the coal, uniformly mixed, is dropped into the scoop, by which it is evenly distributed.

SOUTHERN DISTRICT GAS ASSOCIATION.

The General Meeting of the Association was held last Thursday, at the Hotel Cecil, Strand, W.C. The PRESIDENT (Mr. Harold W. Woodall, of Bournemouth) occupied the chair; and the attendance of members was a large one. Seated among them were noticed a few gentlemen who are intimately associated with the co-operative or co-partnership movement—their presence being accounted for by the paper to be read to the members by Sir George Livesey.

The minutes of the last meeting having been taken as read,

The HON. SECRETARY (Mr. A. F. Browne, of Vauxhall) referred to the letters of regret he had received from members in respect of non-attendance.

ELECTION OF OFFICERS.

Mr. S. Y. SHOUBRIDGE (Lower Sydenham) said he had very much pleasure in proposing that Mr. Norton H. Humphrys be elected President for the year 1908. As the members all knew, the profession had for many years been indebted to Mr. Humphrys for his contributions to the Technical Press. He was quite sure they would agree that they could not appoint a more suitable man for the honourable position of President, and that he would maintain the traditions of the office.

Mr. G. W. ANDERSON (London) seconded the motion, which was unanimously carried.

Mr. A. DOUGALL (Tunbridge Wells) remarked that for the position of Vice-President he had to propose an honoured name in the gas profession. He referred to Mr. James Paterson, of Redhill. He was sure that Mr. Paterson would discharge the duties of the office with credit to himself; and when the time came for him to occupy the higher position of President, he felt certain he would fill the post with much advantage to the Association.

Dr. HAROLD G. COLMAN (London) seconded the motion; and it was unanimously carried.

The PRESIDENT said he had much pleasure in proposing that Mr. A. F. Browne, of Vauxhall, be re-elected Hon. Secretary and Treasurer. Nobody could have carried out the duties of the dual office more ably than Mr. Browne. Having been President of the Association for the past year, he (Mr. Woodall) knew how much work Mr. Browne did, and how well he accomplished it.

Mr. J. W. HELPS (Croydon) seconded the motion, remarking that having had experience of the way Mr. Browne carried out his work, they all hoped the day was far distant when he would feel compelled to give up the position.

The motion was unanimously carried.

Mr. W. D. CHILD (Romford) moved the election of Messrs. T. Berridge, H. C. Head, and E. C. Riley as new members of the Committee.

Mr. J. TERRACE (Tottenham) seconded the motion, which was agreed to.

Proposed by Mr. T. BERRIDGE (Leamington), and seconded by Mr. ARTHUR VALON (London), Messrs. J. L. Chapman and A. Dougall were re-appointed Auditors.

ELECTION OF NEW MEMBERS.

Moved by Mr. J. T. JOLLIFFE (Ipswich) and seconded by Mr. P. E. WILLIAMS (Poplar) the following gentlemen were admitted to membership: Mr. W. A. Vanner, of Walton-on-Thames; Mr. L. Dawson Mosley, of Seaford; Mr. Philip Thomas, of Wellington, Somerset; Mr. J. Ferguson Bell, of Derby; and Mr. W. G. Head, of Vauxhall.

SIR D. FORD GODDARD.

Mr. J. W. HELPS said the members had all probably noticed in the papers that one of their members had been knighted. He referred to Sir D. Ford Goddard. He was an old member of the Association, and one of their Past-Presidents. He (Mr. Helps) should therefore like to propose that a letter be sent to him, congratulating him on the honour conferred upon him by His Majesty the King. They all knew of the good work Sir Daniel had done in his time, not only in the gas profession but also for his fellow men generally; and they felt that his elevation had not only conferred an honour on a man who richly deserved it, but it had indirectly conferred an honour on the gas profession generally and on their Association in particular.

Mr. J. L. CHAPMAN seconded the motion; and it was heartily passed.

THE CAPITAL AND LABOUR PROBLEM.

The PRESIDENT remarked that, before calling upon Sir George Livesey, he should like to say how fortunate the members were in having the benefit of a paper from Sir George on so important a subject as "Co-Partnership." The action of weak and vacillating politicians and the inaction of the middle classes was driving the control of municipal and national politics into the hands of organized labour, and the general trend of commerce was to still further widen the breach that existed between capital and labour. Now that individual ownership was so largely merged in companies, and companies were being absorbed by trusts, the relation of capital and labour was less human and capital was less approachable than it used to be. At the same time, the workman was joining the Unions and losing his own entity, and himself was thus becoming less approachable than he was formerly. It seemed to him (the President) that some common vantage ground was urgently required on which capital and labour could meet on equal terms.

Sir GEORGE LIVESEY then read his paper on

EMPLOYERS AND EMPLOYED AND CO-PARTNERSHIP.

In the industrial world, there is no question of equal importance to that of the relationship of employers and employed, and not one is in such an unsatisfactory position. Great interest in, and much consideration of, this question, coupled with practical experience, have convinced me that the only solution is copartnership—all other attempts being merely palliatives. This conviction is justified by the fact that no other solution has been, or appears at all likely to be, found.

So far as I can learn this perfect remedy was first clearly indicated prophetically by Mazzini, the great Italian patriot, who referring to the labourer said: "You were a slave, then a serf, next a wage hireling, and you must ultimately become a partner." It must be admitted that a solution of this most pressing problem is necessary, and unless something better is introduced, of which there is no prospect—the only alternative being the impossible one of Socialism—I put it to all men who are interested in the question, and are in a position to act, that there is an urgent need for action. This being my conviction, I have to ask your kind indulgence this afternoon.

We are managers of a very important industry, on which the convenience and comfort of the public largely depend. In the interest of the industry itself, as well as that of the public, it is necessary that the supply of gas should be regularly maintained with efficiency, and that the price should be as low as is practicable. We may claim that in this spirit do the responsible managers of gas undertakings perform their onerous duties. We give great consideration to the purchase of coal, both as to price and quality. Much less than 5 per cent. higher price or 5 per cent. inferior quality would bar any coal; and the same rule applies to the purchase of materials generally. Much machinery of various kinds is now used in gas-works, and the questions of efficiency and economy are the main considerations in its selection and use. But we have to do with another factor of a totally different kind, which has been called the human machine—a term I do not like, for man is infinitely more than a machine, but my inability to find a better for the purpose of the argument compels its use.

We spend no end of time and thought on getting the best and most efficient of ordinary machinery, and of working it to obtain the best effect; but what are we doing to develop efficiency in the men we employ. The development of mechanical appliances has a strong tendency to lower the man who attends them to the level of a mere machine. The late Sir Edward Harland, the great shipbuilder, told me that the engineers of the present day could not be compared for skill and ability with the millwrights of his early days, who were then the working engineers. And not only with mechanics but with workmen generally does the modern system of large joint-stock businesses, and the adoption of labour-saving appliances, tend to the elimination of individual responsibility and the use of the thinking powers of the workman. "You are not paid to think, you are simply to obey orders and do the work," is a common remark—perhaps not often put into such ungracious words. But men are very often treated in that spirit; and the general tendency of joint-stock employment is in that direction. The animal part of the man, the simple machine, is used, but the infinitely more important parts—heart, brain, and will—are neglected, and his intelligence is not called into play as it might be. Further, the wages system of payment for time does not act as a stimulant to a man to put his heart into his work; neither do piecework and other similar devices, although they are an inducement to work harder. It has been said, and it is a fair representation of the general feeling, "My employer's business is his business, and not mine; it is, therefore, his business to look after it." We want workmen who will take an employer's interest in the business by which they live—to work with body and brain, and put their hearts into it. Does not this mean partnership and nothing else.

The above is simply a general statement of the case, it is not intended as any attack on workmen. I do not blame them; they are victims of a bad system, which, although much could have been said for it when businesses were small and masters and men worked together, is now utterly outgrown by the great development of the joint-stock and factory system, and urgently needs amendment. Neither do I blame employers; but I do say that employers are the men and the only men who can inaugurate a better system. And happily no revolution is required.

WAGES EXPENDITURE.

Is there a member of this Association who knows approximately the proportion salaries and wages bear to the general expenditure of a gas undertaking? Coal, of course, is the chief item which when prices are normal, accounts—according to "Field's

Analysis"—as near as may be, for half the total expenditure, from which, for this purpose, I exclude rates. Wages make a good second, and probably amount to a third part or even more of the total manufacturing and distribution expenditure. If salaries are added, 40 per cent. will probably not be far wrong. Therefore only about 10 per cent. is left for all other items except rates. The accounts of gas undertakings give very little detail and no total of salaries and wages.* I think, if the 52 weeks' wages are added up, many of you will be as surprised as I was on seeing the total, which includes wages paid on capital account.

Suppose this very large proportion of the total expenditure were for materials or apparatus, how should we regard a possible reduction or increase of even 5 per cent. There is very much more than 5 per cent, to be saved or lost on labour. The chairman of one of the largest manufacturing establishments on the Tyne put to me the question, "How can you share profits if you make none?" I replied that the profit shared is earned by the workmen (the rate of bonus paid to our men was then 5 per cent.), and I answered his question by another: "Is not a cheerful, willing worker worth 5 per cent. more than the ordinary workman?" His answer came like a shot, "Five per cent., say twenty."

The Thames Iron-Works Company found that their "Good-Fellowship" plan—whereby the men were given an interest in their work—increased their efficiency 17 per cent.; but difficulties in working put an end to the system some years ago. Lately, the "Premium" system has been introduced into this country, by which a premium is given for time saved, and instances are mentioned of reductions of 23, 25, and even 36 per cent. of the time occupied in doing certain work.

At any rate there is certainly a very large margin of latent power and efficiency waiting to be developed; but the question you have a right to put is whether it can be made available. Although copartnership is in other ways very beneficial both to employers and employed, it must be economically advantageous to justify its adoption. In fact, it stands or falls on the question, "Does it pay?" That it develops latent efficiency, there is no doubt; but evidence that the bonus is earned by the workers is difficult to produce, because standards of comparison are wanting. The only definite evidence available in the gas industry is in the item of carbonizing labour, which is taken from that impartial source, "Field's Analysis." The rates of wages, the methods of working, and the conditions of employment in the retort-houses of three Metropolitan Companies were very nearly alike in 1888. With the coming of the Gas-Workers' Union in 1889, all three Companies adopted machinery. A little later two of them installed carburetted water gas plants which materially reduces the cost of carbonizing labour. The South Metropolitan Company, at the end of 1889 introduced its profit-sharing (now co-partnership) scheme—proof of its economical advantage being found in the following figures.

Table I. shows the cost to the three Metropolitan Companies of carbonizing labour per ton of coal and per 1000 cubic feet of gas sold; the rates of wages of the retort-house men being practically identical. The figures per ton are given because the difference is more perceptible than it is with fractions of a penny in the gas sold figures. The cost per 1000 cubic feet for the Chartered and Commercial Companies is averaged in the fifth column as the basis of comparison with the South Metropolitan; and the difference is shown in the last column.

Table I.

Year.	Chartered.		Commercial.		Mean per 1000 Cub. Ft.	South Metropolitan.		More or Less than Mean.
	Per Ton.	Per 1000 Cub. Ft.	Per Ton.	Per 1000 Cub. Ft.		Per Ton.	Per 1000 Cub. Ft.	
	s. d.	d.	s. d.	d.	d.	s. d.	d.	d.
1888	2 8·4	3·34	2 9·7	3·55	3·45	2 7·0	3·27	−0·18
1889*	3 0·6	3·80	2 11·0	3·70	3·75	3 3·7	4·23	+0·48
1890	3 7·0	4·54	3 4·8	4·40	4·47	3 7·0	4·61	+0·14
1891	3 6·0	4·56	3 6·4	4·68	4·62	3 1·8	4·01	−0·61
1892	3 4·0	4·15	3 5·9	4·61	4·38	2 11·6	3·78	−0·60
1893	3 5·0	4·25	3 5·5	4·48	4·35	2 10 0	3·66	−0 69
1894	3 5·0	4·27	3 4·8	4·38	4·32	2 7·0	3·32	−1·00
1895	3 4·5	4·24	3 5·2	4·48	4·36	2 4·5	3·06	−1·30
1896	3 4·8	4·26	3 4·5	4·42	4·34	2 4·5	2·99	−1·35
1897	3 5·1	4·19	3 4·3	4·25	4·22	2 2·6	2·78	−1·44
1898	..	4·08	..	3·49	3·78	..	2·79	−0·99

* Gas Workers' Union formed, and South Metropolitan strike followed in December.

The figures for 1898 are misleading. Those of the Chartered and Commercial Companies would be higher for coal gas only, but carburetted water gas had come so much into use that in 1898 the rate per ton was dropped.

In 1888, there was very little difference in carbonizing wages per 1000 feet of gas sold. In 1889, came the great disturbance, and the item went up generally about 1d. per 1000 cubic feet, or over 25 per cent. The South Metropolitan Company's strike adversely affected the Company in 1889-90 and in July of 1890 the first profit-sharing bonus was declared. In 1891, the cost of carbonizing was appreciably lower; and so on year by year. The difference in favour of the South Metropolitan Company from 1891 to 1898, inclusive, taken from "Field's Analysis" in Table I., averages 1d. per 1000 feet sold against 0·18 of a penny in 1888. In the eight years, £820,000 was paid for carbonizing labour, which is £260,000 less than it cost the other Companies to make the same quantity of gas, or very nearly 25 per cent. lower. The whole of the difference cannot be owing to the co-partnership. Probably something considerable was due to the unsatisfactory action of the Union men, whereby the economical advantages of machinery were considerably neutralized. But allowing for this and other possible causes, the large difference cannot be accounted for unless the beneficial influence of co-partnership is admitted.

If we say only one-fifth part of the £260,000 was thus saved, or £52,000, it amounts to nearly 6¼ per cent. on the total paid in wages, and exceeds by several thousands the total profit-sharing bonus, of rather under 6 per cent., given to the stokers in those eight years. And even in 1906—notwithstanding the large reduction of carbonizing costs per 1000 feet by the Northern Companies (making 22 per cent. or more of carburetted water gas, and happily with no restrictions by the Union on the use of machinery), the difference in favour of the South Metropolitan Company amounts to an annual sum considerably in excess of the amount of the co-partnership bonus, which was at the rate of 9¾ per cent. on salaries and wages in 1906.

I must here say that the absolute necessity of proving my case is the sole reason, and my only justification, for introducing these comparative figures; it being only in this way possible to prove co-partnership a paying branch of business. The point, however, is so important that corroborative evidence is necessary.

The South Suburban Gas Company started co-partnership in 1893, and the first bonus on salaries and wages was paid in July, 1894. The yearly rate of bonus from 1894 to 1900 was 3, 4, 5, 5, 5, 5, 5½ per cent.; in 1901, it fell to 2 per cent.; then 5, 5, 5½, 6½, 5½, and 6½ per cent. in 1907.

Table II. shows the cost of carbonizing wages from "Field's Analysis," from 1891 to 1901. From 1894 to 1897 (the first four years of co-partnership), the cost of carbonizing was practically the same as before. I was greatly disappointed and surprised, for I expected results similar to those at the South Metropolitan works. In 1897 there was marked retrogression; but in that year Mr. Shoubridge was appointed Engineer. Some months after I drew his attention to the fact, and found that, contrary to instructions, an absolutely essential to success had been ignored. There had been no discrimination exercised in the granting of agreements—every man, whether a good, bad, or indifferent worker, had been allowed to sign an agreement which entitled him to the bonus. There is one sure and certain way to bring the good workman down to the level of the indifferent one, and that is to treat them both alike. This is the inherent weakness of the wages' system; but it is ruin to co-partnership. At the start in 1893 every man in regular employ was rightly permitted to sign, on the assumption that he was a good worker; but afterwards it is absolutely necessary to exercise discrimination.

Any co-partner who is careless or indifferent about his work, and shows no interest in it or in the Company, must be told when his agreement expires that it will not be renewed until he improves, and that then he may apply for a renewal, which should be given for say three months, instead of for twelve, as usual. If he does not improve, he gets no new agreement, and his ultimate fate is to leave. Well, this absolutely necessary rule was ignored at Sydenham for the first four years, with the inevitable result—failure. Mr. Shoubridge put his heart into the work, entered into its spirit, and failure was turned into success. A great improvement took place in the first year, and each succeeding year was better than the last as proved by Table II.

Table II.—*Carbonizing Wages per* 1000 *Cubic Feet of Gas Sold.*

Year.	d.	
1891. . . .	4·29	Average for the three years, 4·29d.
1892. . . .	4·30	
1893. . . .	4·28	
1894. . . .	4·20	
1895. . . .	4·17	
1896. . . .	4·13	,, ,, four years, 4·27d.
1897. . . .	4·59	
1898. . . .	4·05	—reduction of 0 22d. from the 4·27d. average
1899* . . .	3·69	,, 0·58d. ,, ,, ,,
1900. . . .	2 94	,, 1·33d. ,, ,, ,,
1901. . . .	3·01	,, 1·26d. ,, ,, ,,

* Carburetted water gas was introduced at the end of 1899. The figures per 1000 for 1900 and 1901 are corrected for coal gas only, and are therefore higher than those given in "Field's Analysis."

The saving in the carbonizing wages per 1000 cubic feet of gas sold in this case also greatly exceeds the amount of bonus given to the men, and is another direct proof that co-partnership pays financially. It is no true co-partnership if it does not benefit both employed and employer financially; for much of its success must be due to the employer who not only initiates it but on whom also mainly depends its proper and successful working. It is, therefore, quite fair that he should benefit equally with his workmen; and my experience is that they are content it should be so.

So far as carbonizing is concerned, the above evidence is conclusive; but as to other work, no figures are available. But there

* It might be well to give the totals in these Socialist days; for recently two London Companies have been publicly unjustly attacked on the apparently small amount paid for labour, as it appears in the accounts, compared with interest on capital. The amount of carbonizing wages only was contrasted with the dividend and interest as an example of what the Socialists call the exploitation of labour—whatever the phrase may mean. The fact is that, notwithstanding the very large capital required by gas undertakings, the amount paid in wages alone, without salaries, largely exceeds the interest on capital.

is no reason to suppose that they are in any way different from the stokers. There is, however, abundant evidence of real interest taken by the workmen generally in their work, and in the Company's well-being. Such interest is especially necessary where no direct and close supervision can be exercised, which is peculiarly the case with the large proportion of employees of gas companies who are at work in the district. If these men can, by the adoption of the principle of partnership, be induced to make the best use of their time, to do their work carefully and well, and to economize in the use of materials, as certainly is the case to a considerable extent, then there is no doubt that the co-partnership bonus is earned, and that the system pays commercially.

I used the words, "to a considerable extent," advisedly, because I do not believe it is the fact, neither can it be expected that, in this short time, all the habits and methods of thought under the deadening influence of the day-wage system can be entirely changed all at once. It must take time, and we must have patience; but I can say, with the full support of officers and foreman, that a new spirit is manifested which makes all our dealings with the workmen easy and pleasant, and induces good and careful working generally. I go so far as to say that, entirely apart from the financial question, the advantages of co-partnership are such as to fully justify its adoption—nay, rather make its adoption most desirable, in all businesses and especially in gas companies, where its practicability has been proved.

One of the best definitions of co-partnership was given by the late greatly respected Bishop of Durham, Dr. Westcott (though he was speaking of co-operation): "The co-operative ideal of production is that all who combine in a business should be partners in it—partners in the contribution of capital; partners in profit and loss; partners in control and development; and partners in responsibility."

That is the ideal of Mazzini's prophecy, and happily it is practicable. Will the gas industry add one more to, and greater than any of, the inestimable services it has rendered to the community by leading the nation to a real, permanent, and satisfactory industrial peace? It is a work worth doing, and one that has given those who have entered upon it unqualified satisfaction.

There are of course difficulties in the way—it is always difficult to climb—but they are to be overcome. There are difficulties in starting; and when they are past, there is the working of the system to claim attention. It is necessary to start right. A few years ago a writer in the "JOURNAL OF GAS LIGHTING" said he had tried profit-sharing, and found it a failure. He admitted he had started it with the object of getting more out of his men. He tried "giving a sprat to catch a herring." The artifice was seen through, as it was certain to be, and nothing was caught.

For the movement to succeed, it is absolutely necessary to remember that there are two objects of equal value to be ever kept in view. It must (if it is to be successful) be beneficial to both employers and employed. If it does not really and permanently benefit the latter by enabling them to improve their position in life, and give hope for their future, it will be at best only a very transient benefit to the employer and must sooner or later share the fate of all failures. Simple profit-sharing—the payment of the annual bonus in cash—is a failure because it does not permanently benefit the recipients, or the great majority of them. A few make good use of the bonus by saving; but generally it is spent as it is received, and instead of encouraging thrift it does exactly the reverse.

If the position of the wage-earners, and of some others, is to be improved, it is essential that they should become owners of property; and for the majority of workmen profit-sharing co-partnership is the only practical way. By giving the profit-sharing bonus either wholly or at least half in stock (instead of cash), the object can be—is, in fact—attained. Work co-partnership with the object of benefiting the employees and the benefit of the employer follows naturally and certainly.

There must be some method of entering a co-partnership; and in the case of the gas industry the system of "contracts of service" in the form of agreements meets the case admirably. The Conspiracy and Protection of Property Act, of which certain sections are required by law to be posted up permanently in all gas and water works, points to the necessity for contracts of service in order to protect the public against the possibility of interference in the supply of gas or water by a strike. How many gas companies have adopted the Act by making contracts of service with their workmen, I do not know; but the system, in common with the joint-stock limited liability system, seems to be made for co-partnership; and on the proper granting of agreements, its success depends—that is, if they are granted improperly it will fail as already shown. It seems a small thing, but a small leak neglected will sink a ship; therefore the control of the agreements must be held by the chief officer, and not left to any subordinate or foreman. Unworthy men must not have their agreements renewed; but the refusal to renew must be the act of the chief, after considering the reports of his subordinates. The Engineers of our various stations are primarily responsible. But there is an appeal to the head; and not infrequently reference is made to me. The task is one of great responsibility, for it involves the question of absolute justice so far as man can exercise it, and the success of the co-partnership system depends on just administration.

Renewal of agreements is also refused to men who persistently withdraw their bonus or who sell their stock to outsiders—publicans or loan offices, for instance. All stock sold must be to the Company, purchased by the co-partnership money in hand, by which means the reasonableness of the sale can be ascertained. This may be objected to. But the greatest difficulty any of the Co-Partnership Companies have had is with the thriftless workmen, who are the enemies of co-partnership; and if all were like them, failure and abandonment would have resulted long ago. We say to these men: "The money is yours, and you can withdraw it and sell your stock if you choose. This is your right. But we have an equal right to refuse to renew your agreement; and until you become thrifty and have saved a respectable amount, in the Company's savings bank, your agreement will not be renewed." This is done by the Hon. Secretary of the co-partnership; but the man can appeal to the chief officer or to me. By these means the sale of stock, and the withdrawal of the half bonus deposited with the Company, has been practically stopped; and now very nearly the whole of the bonus—not only the half invested in stock by the rules but the withdrawable half as well—is now regularly saved and invested. If the whole were invested in stock under the rules, which some favour, there could be no self-control and self-denial called into exercise by the men in the practice of voluntary thrift. For that reason I prefer our plan.

The South Metropolitan's total bonus of last July was £45,590. Part of this was paid to winter and other men on leaving, and a small portion was left on deposit, and £42,600 was invested in stock. The South Suburban Company were even better. It is true, this has involved some trouble, and much thought and consideration; but it has been freely and cheerfully given by those who work the system, of whom I cannot speak too highly. And they have their reward. I think they will say that no labour in which they have ever been engaged has given them equal satisfaction.

It is not necessary to repeat the details of any of the schemes which have been often made public; my object being to prove the necessity and the wisdom of co-partnership. Any who think of adopting it can have every information on the subject, upon application to the officers of any of the Co-Partnership Companies, who will give it with pleasure. Only five Gas Companies have adopted the system—three in London and Chester and Newport. One reason why there are so few is, I believe, due to the generally good relations that exist in gas-works; but those good relations may be broken at any time under the pernicious teaching of Socialism, of which ownership of property is the true antidote. I have served the gas industry for nearly 60 years, and am anxious still to serve it. I have had failures, and have made not a few mistakes; but co-partnership does not come into either category. During those years I can say that never have the relations of the Company and its workmen been so pleasant and satisfactory as they are now; and to say this is to very inadequately express the reality. As a contrast, I would say that the most miserable time I have ever known, both for the workmen and the officers, was the five months' recognition of the Union in 1889. I desire for the gas fraternity the same peace and satisfaction that we enjoy; and for that reason I am here to advocate co-partnership. Let there be a free and full discussion, objections and difficulties urged, and questions asked. That will be much more satisfactory than any merely complimentary expressions.

The PRESIDENT asked Sir George to give a little information as to how to start the scheme.

Sir GEORGE LIVESEY (in complying) said that, if the company proposing to adopt the system was a sliding-scale one, there was no question whatever that the right course to pursue was to extend the sliding-scale to the employees. The shareholders obtained a certain advantage for every reduction in price; and putting the employees in the same boat—giving them the same interest as the shareholders—was undoubtedly the right course. It was not necessary to take the standard price as the starting point for the sliding-scale for the employees; but it was better to do so. For instance, if a company had a standard price of 3s. and were selling at 2s. 6d., it would perhaps be the best plan to take the standard price for the co-partnership at 3s., and allow ½ per cent., ¾ per cent., or any other percentage the Directors might choose to name for every penny at which gas was sold below 3s. The South Metropolitan Company allowed ¾ per cent.; the South Suburban Company 1 per cent. for the first 5 per cent., and then ½ per cent. afterwards—that was to say, a start was made with 1 per cent. for every 1d. reduction until the bonus reached 5 per cent., and then it was reduced to ½ per cent. for each additional 1d. That was all simple enough. Then as to non-sliding scale companies, an arbitrary standard price could be fixed; and for every 1d. the price was reduced below that arbitrary standard, the employees could be allowed any determined bonus. But the shareholders would be left out of that system; and it did not put the employees on the same footing as the shareholders, as was the case where the sliding-scale existed. In the case of non-sliding scale companies, he should advise that the bonus be based on the dividend. Only just lately he had been asked to advise an English gas and water company; and his proposal was that they should base their co-partnership bonus on the dividend. They were paying 5½ per cent. on their 7 per cent. stock. He suggested that the dividend should be this basis; but that, instead of beginning at once to pay the 5½ per cent., the bonus on the salaries and wages should the first year be 4 per cent., with a promise that it should go up ½ per cent. per annum until it reached the level of the dividend on the stock, afterwards rising and falling with it.

It would not do to start with a less bonus than 3 per cent.; 4 would be better, but not more than 4, because it was best to start low, with a prospect of rising. This gave an identity of interest between the shareholders and the workers in promoting the prosperity of the company. Then as to how to start the system. In introducing co-partnership what had to be done was to print as clear a statement as possible showing the basis, the benefits, and the conditions of the scheme. He would, when the paper was published, give a description of the sort of notice that should be adopted. On starting the system, the chairman of the company should, with other directors and the chief officers, meet the employees and explain the scheme, and offer it to all (or any) who chose to accept it by signing an agreement, which was simply the contract of service required by the Conspiracy and Protection of Property Act. It was not necessary that all should accept, for the scheme could be started and worked with only a small proportion, and then a Co-Partnership Committee must be formed, of equal numbers of men elected by ballot by their fellow co-partners and of members nominated by the Board—the South Metropolitan had 18 of each and the South Suburban 6, or 12 in all; the Chairman being Chairman of the Committee.

Mr. S. Y. SHOUBRIDGE (Lower Sydenham) said as one who had had over twenty years' experience of the working of large gas-works without the co-partnership system, and of more than ten years in another works where the system was in use, he desired to bear testimony to the great advantages which co-partnership conferred. His earlier and longer experience without the benefits of co-partnership included a period in which there were many disputes with the men, of a minor character, and two disastrous strikes, in both of which the men were defeated; but not until the employers and consumers had suffered considerable loss and inconvenience, and the men and their families much privation and suffering. The strikes were the outcome of the attempt of the Gas Workers' Union to prevent the employment of non-Unionists, and to control the management of the works by dictating the terms on which the work should be carried on. Looking back on those troublous times, and contrasting them with the happy conditions which existed under co-partnership, where strikes and disputes were impossible, he was indeed deeply grateful to the author of the paper for his untiring efforts to bring about what President Roosevelt had described as a "righteous peace in the industrial world." In his (Mr. Shoubridge's) earlier experience, the employees, he thought it was fair to say, took little or no interest in their employers, or in their work, beyond the wages they received. The success or failure of the undertaking gave them no concern, and there was no incentive to exertion beyond the fear of dismissal; for there was no hope of reward beyond the daily wage. There was no collective effort, no unity of interest, no *esprit-de-corps*. And it was fair also to say the employers took little or no interest in their employees. They paid the wages, and expected the employees to do their allotted tasks; and there the matter ended. There was no attempt to give the employees a pecuniary interest in the success of the undertaking, far less to make them partners in it. There was no attempt to improve the employees' position in life by inculcating thrift, and giving them the means to save. Under co-partnership, he (Mr. Shoubridge) had found a very different state of things. The employees were part owners of the undertaking; and their stake in it grew year by year. They realized that its success meant their advantage, and that anything which injured it injured them. They had a common interest, and realized that it was the duty of everyone to do his best for the common good. This had brought about, gradually and almost imperceptibly, the elimination of careless and idle men. There was no room for drones in the co-partnership hive; they could not exist in such uncongenial company. It had also improved the pace and quality of the services rendered. As owners of the Company's stock, and therefore partners in the concern, they stood on a higher level than the ordinary workman in other undertakings, who rarely had any balance in the bank, but lived from hand to mouth, with no reserve for old age or emergencies. This gave them a higher sense of duty and responsibility, and made them better servants. The improvement, of course, had been gradual, increasing year by year as the men realized more and more, by the growing balance to their credit, how great were the advantages of the system. Equally, of course, it was not attained without persistent effort—nothing so good ever was or ever would be. The author had devoted so much time in devising and perfecting the system, that the work was easy for all who followed him; but, of course, at the commencement of the introduction of the system anywhere, it needed the sympathetic and careful guidance of those who managed it. The child must be led by the hand until it was old enough to run alone; and those who took this trouble would find ample reward. The introduction of the system must always be the work of the directors of the undertaking; but its success depended principally, in all companies which were not under the chairmanship of the author, upon the sympathetic care of the chief officials, who must be convinced of its advantages, anxious for its success, and willing to take some pains and trouble in making the way smooth for it. Statistics he had taken out would show what had been done for the co-partners in the South Suburban Company. He very heartily commended the system to those officials who heard him, or who might read what he said, firstly, on the low ground of self-interest. It helped one personally in two ways—by making the management easier and by increasing one's own income. In his own case, it had enabled him to become in ten years the possessor of more than £1000 of the Company's stock. Secondly, because it helped one's fellow-employees, and lifted the workmen to a higher status, made them thrifty, and provided for their old age. Thirdly, because it would benefit the employers and consumers, by increased dividends and cheaper gas. Lastly, because the success would induce others to follow the example, and so help the gas industry to lead the world towards that happy consummation when capital and labour would go hand in hand in peaceful progress, each striving for the other's good. "May you," said Mr. Shoubridge in conclusion, "all be inspired by the author's splendid example to take part in this noble work, and may he long be spared to witness the labour of his life bearing abundant fruit for the benefit of mankind."

Scheme introduced in	1894.
Present number of co-partners	533.
Holding of stock and deposit by 533 men	£28,168.
Average per man	£52 17s.
Amount paid as bonus this year	£3079.

(Twelve co-partners have purchased the houses they live in through the Company's Building Society.)

Present holding of the Company's stock by the employees—

Over £25 and under £50	183
,, 50 ,, ,, 75	30
,, 75 ,, ,, 100	8
,, 100 ,, ,, 200	12
,, 200	17
Under £25	283
	533

Mr. W. B. RANDALL (Waltham Cross) said the last sentence of the paper was not read by the author; but it inspired him to make a few remarks, and to ask Sir George one or two questions. It occurred to him that this question of profit-sharing wanted to be entered upon on a more equitable basis with the men than that of the present scheme. He meant this: Take the present high price of coal. It appeared to him that, speaking now for the stokers—and the stokers were generally mentioned in the paper—they, more than any other class, were penalized by a high cost of coal. Whatever their efforts might have been last year with cheaper coal, they would be mulct because of the price of coal going much higher. At any rate, he thought it was so. Another point was how far was the scheme applicable to gas companies—to what size of concern was it applicable? Was it from the largest to the smallest, or was there a minimum to which it was applicable?

Sir GEORGE LIVESEY: From the largest to the smallest.

Mr. RANDALL said his impression on the general subject was this, that none of their workmen would for a moment object to the profit-sharing or co-partnership system if they were going to get something more put into their pockets at the end of a week or year than they received now. The difficulty was, How were officials to persuade their directors to give the scheme to the workmen and the officials? Take the figures that Sir George had mentioned in his paper. Comparisons were given; and therefore he (Mr. Randall) was quite at liberty to say that he knew of several companies who were getting quite as good results as the South Metropolitan Company without a profit-sharing scheme. Some companies obtained a larger make of gas as well as a larger sale of gas and coke per ton. When these figures were placed before their Directors, they would say, "Well, on the basis of the South Metropolitan figures, how are we going to benefit by the scheme?" That was a point which required careful consideration.

Sir GEORGE LIVESEY: I do not put the South Metropolitan Company forward as a model for anything but co-partnership.

Mr. H. E. JONES (London) said regarding Mr. Randall's last point, as to why gas directors should adopt the system, the answer was, because it was human wisdom to do it. There might be other companies that made gas better than the South Metropolitan Company; but what would those companies do to-morrow if the Union came along? Then Mr. Randall made a point about the working of the system in the case of the stokers with dearer coals. Well, the foundation of the movement was to get the sympathy of their employees. (He might parenthetically say that small companies were just as well situated as large ones for the introduction of this or a similar system.) He himself had had the management of a small company, and he knew all his men by sight and name; there was a personal sympathy between the men and himself; and he could get them to make great efforts without a profit-sharing scheme. When, however, he got to larger-scale works, he found it was impossible to know his men; they became separate units by their large number. The smaller employer was able to create sympathy between himself and his men. They would go to him with their personal troubles. They would even ask for the loan of money. [Laughter.] "You laugh," said Mr. Jones, "but why should they not go to their manager with their troubles, and have an advance of money if they are pressed? A wise company will let their manager do this sort of thing rather than let the men fall into other hands."

Mr. CARPENTER: They laugh at your knowledge of human nature, Sir. [Laughter.]

Sir GEORGE LIVESEY: You must not, however, let that kind of thing go too far. I find that such men are prone to become regular customers. [Laughter.]

Mr. JONES (proceeding) said, respecting the point as to the stokers, he failed to see why the men should not sacrifice some-

thing, and experience some loss by the rise in the price of coal. The men were only working in an industry like themselves—like the directors, the shareholders, and the officials; and they must share the incidences common to their employment. If they did not, they would be living in a fool's paradise. Most of the men under the system were shareholders. They became shareholders rapidly; and directly they were shareholders, they were interested even more. The great charm of the whole thing, however, was that, within a few years of the works being practically under the dominion of the Union, when they now gathered round a table with the men's representatives, there was cheerful response to wishes, there was a friendliness, and quite a difference in both tone and attitude; and when going on to the works, there was a friendly salutation, and not a sulky passing by. One of his sons was connected with a small company in the outskirts of London; and he had brought before his fellow-directors a scheme for putting the workmen of that undertaking on a somewhat similar —it was not exactly on the same lines—scheme of profit-sharing. Some of his colleagues did not see where this was going to pay. But they were persuaded; and the scheme had been introduced. This was only comparatively recently; but he was certain that in a year or two his son would be able to come before the members, and report as to the good fruit it had borne. He (Mr. Jones) could bear testimony to the vast improvement, the co-operation, the friendly tone, and the respectful attitude of the men, where the system was in vogue, towards those who had to direct their employment. The Commercial Gas Company had not followed up the system to the extent of yet having a workman director. He did not say that he should be opposed to their representation; but representation might take a different line from that which obtained in the other companies. This he could say, that the Commercial Company would rather surrender a considerable amount of money than their system; and in making this declaration, he was speaking from the Directors' side of the table.

Mr. JAMES W. HELPS (Croydon) said, like Mr. Randall, he rose to speak on account of the concluding sentence of the paper, where Sir George suggested that the remarks made should not be entirely complimentary, but that discussion should be raised on any difficulties that occurred to one. He should like to preface what he had to say by observing that he certainly did not rise as one who was in any way antagonistic to the principles of the scheme. He believed in it to the extent of saying that, if his men showed any inclination in this direction, he should at once bring the scheme before his Directors, and ask them to give it favourable consideration. There were, however, certain points in the scheme with which he did not agree; but, taken as a whole, at any rate theoretically, and Sir George had proved practically, that it was fairly perfect. But he did want to point out that he hardly thought Sir George had proved his case by quoting the figures in Tables I. and II. He (Mr. Helps) would not deal with Table I., but he would direct attention to Table II., which gave figures showing the cost of carbonizing coal per 1000 cubic feet made at the South Suburban Gas-Works. Sir George stated that in the initial stages of the scheme, it was not entirely satisfactory at those works; that the Engineer had made certain mistakes, which were rectified later on; and, when they were rectified, the cost immediately began to go down. He (Mr. Helps) should like to point out that the year that was first quoted —viz., 1898—showed a decided drop in the carbonizing wages compared with the average of the three or four preceding years. Might he say that at Croydon a drop occurred, without any profit-sharing scheme, to the extent of three times the amount that occurred in the South Suburban Company in that year, although in the next two or three years the drop was not so great as in the case of the South Suburban Company? But the drop was due to the effect of labour-saving machinery and regenerative furnaces which were installed at the South Suburban works to a far greater extent than at Croydon. It was not until 1902 that compressed-air stoking machinery, and regenerative furnaces a little earlier, were adopted in Croydon; and if they compared the sources from which Sir George had taken his figures, the moment they got their stoking machinery in order, and gave up the use of ordinary direct firing and shovel charging to a great extent, the cost of carbonizing wages came down to a lower level than that ruling in the South Suburban Company. In 1905-6 at Croydon, they used nothing but stoking machinery and regenerative settings; and the result was that in 1905-6 their carbonizing wages came down to 2·15d. against 2·33d. for the South Suburban Company. In 1906, at Croydon they dropped to 1·75d., as against 2·17d. for the South Suburban Company. Now he thought Sir George and Mr. Shoubridge——

Sir GEORGE LIVESEY: That has nothing to do with the comparison here. The conditions were the same from 1897 to 1898. Of course, I am aware, as well as anybody in this room that machinery affects the thing very largely; but I think Mr. Helps should confine himself to the years in the table. Mr. Shoubridge would say that there was practically no difference between those years. He had not then been there long enough to introduce machinery.

Mr. HELPS said he knew the South Suburban works almost as well as his own works, and had known the conditions there for many years past. He was perfectly confident that, in the years he mentioned, stoking machinery and regenerative firing were installed to a far greater extent than at Croydon.

Sir GEORGE LIVESEY: There is no comparison with Croydon in the paper. My comparison is the South Suburban with the South Suburban; and the conditions were the same in the two periods.

Mr. HELPS: I think I have a perfect right to compare Croydon with the South Suburban, seeing that the South Suburban is dealt with in your figures.

Sir GEORGE LIVESEY: I am not comparing the South Suburban with Croydon; but, in different periods, the South Suburban with itself.

Mr. HELPS thought that Sir George, Mr. Shoubridge, and Mr. Jones, and all those who had experience of this system, would acknowledge that the great and the good results that had been produced were due to the fact that the men employed on their works were working better; and that there was a far better feeling of good fellowship between employer and employed. They would also agree that, if the same result could be obtained in any other way—if there was a possibility of doing it in some other way—then it would bear favourable comparison with the scheme before them. He did claim that in Croydon they were able to bring about this good working, good fellowship, and good feeling throughout the works; and it had yielded the result he had already indicated. It seemed to him that what this co-partnership scheme had succeeded in doing had been to eliminate the bad workmen; and any scheme that would eliminate the bad workmen, and confine the work only to those men who were thoroughly good workmen, would bring about such results as had been obtained at the South Metropolitan Company and South Suburban works. Sir George had already told them that this scheme could only be brought to a successful issue by the elimination of the bad workers; and it was not until after the poor workers had been eliminated, and the work had gone over to the good men, that these results were obtained. During the period the elimination was taking place, a good deal of trouble occurred; and a good many engineers would hardly like to have the trouble that had taken place in connection with this matter. He therefore thought that those companies who had chairmen and engineers who had not had the experience of, and who were not so keen and enthusiastic as, Sir George, were not likely, without further information, to adopt the scheme, knowing the troubles that they would have to go through. He did not wish to run down the scheme in any way; he was simply raising the point as to whether the author of the paper had proved that the good results that had been obtained in the companies he named were entirely due to the profit-sharing or co-partnership scheme. He thought Mr. Jones raised an important point, when he asked what would happen supposing the Union came along, and suggested a strike.

Mr. JONES: I did not suggest a strike.

Mr. HELPS: Well, then, trouble. Proceeding, he said that he could not help thinking that even the South Metropolitan Company were showing just a little fear. Sir George himself had told them they had even found it necessary to make their agreements terminate at all sorts of days in the year. As he remarked before, he did not want to say anything antagonistic to the scheme, but merely to point to the difficulties that had occurred to him. He believed that the scheme was theoretically a perfect one; but there were certain difficulties. But for the personal influence and enthusiasm of Sir George Livesey, too, in carrying out the scheme, he did not think it would have proved so successful as it had done in the case of the companies mentioned in the paper.

Mr. J. FERGUSON BELL (Derby) said it was some years since he introduced the system of profit-sharing; and therefore he should like to add his testimony. For months past, all of those present must have seen that many minds had been thinking over how to reconcile Capital and Labour. Happily in the railway world means were found; and instead of fear now of a railway strike, Boards of Arbitration were to be formed, and any differences between the employers and the workers were to be settled by arbitration, which, he thought, was a step in the right direction. As a humble follower of Sir George, in 1889, he recommended to the Stafford Corporation a profit-sharing scheme, and in 1900 the scheme was adopted. This happened to be his last year in the management of the Stafford works; and he had no hesitation in saying that that year was the most pleasant in his experience in the relations between the men and himself. And, further than that, it was the best year financially that he ever had there. Mr. Pooley, who was his successor at Stafford, had continued the scheme, because he had found it financially successful; and when he (Mr. Bell) told them that, according to the accounts of the Stafford Gas Department for the year ending March 31 last, the total cost of gas, which included coal (less residuals) and all working and distribution expenses, was only just over 11d. per 1000 cubic feet, he thought they would have reason to say, at any rate so far as Stafford was concerned, that profit-sharing had not done any harm. He believed it was one of the best things introduced there; and the only fault in the Stafford scheme was that the bonus earned by the men was equally distributed among them, and the whole of the amount was paid out in cash. This he thought was a great mistake; but he believed he was primarily responsible for it. He thought the bonus should not be paid in cash, because, unfortunately, when they gave some men a cash bonus or payment, it did not do them any good—sometimes it did them harm. The bonus should be invested in the business.

Sir GEORGE LIVESEY: Could you do that in Stafford with the Corporation?

Mr. BELL replied that they could not; and he was going to ask Sir George how, when works belonged to a municipality,

they were going to invest. In a gas company, it could be quite readily done. Reading between the lines, Sir George seemed to be somewhat disappointed that more companies had not adopted co-partnership. Probably one reason was that they were so used to paying men by a fixed rate of wages that boards of directors, when things were going smoothly, did not like to disturb the existing condition of things. The question also arose, if they were going to start a scheme, What was a fair amount to give the men so as to make them take an interest in their business, and also to unify the various interests? He thought that profit-sharing had another aspect than that of £ *s. d.*, because it was worth something, as said in the paper, to have a happy, contented body of workmen; and this, from his own experience, was what they gained. There was one other matter he should like to put to Sir George. He noticed that in the South Suburban Company the profit-sharing varied from 6½ per cent. down to 2 per cent. He should like to know whether there had ever been any difficulty with the men or any dissatisfaction through the profits going down. He might say that, in the scheme he introduced at Stafford, they had a certain fixed price for gas (the price was 2s. 6d.), and for anything less than that they divided 1 per cent. for each penny. Mr. Pooley, his successor, had altered this, so that it applied to labour only. But that he (Mr. Bell) thought was wrong. If they were going to have co-partnership, the men ought to benefit if there was a reduction in price—they ought to share in the reduction. He was looking forward to the time when his Company, which had only lately become a standard-price Company under the sliding-scale, would introduce profit-sharing or co-partnership, because he believed it would be to the best interests not only of the Company, but of the town at large. It would, he was certain, enable them to supply gas cheaper than at present. The gas industry owed a great debt of gratitude to Sir George for what he had done in the matter.

Mr. T. GOULDEN (London) said it seemed to him they would never realize the benefit of profit-sharing until they got away from the present "piping times of peace." Its value would be felt most in times of trouble, because it would be much more difficult to take men, working under such a scheme away from good work to join agitators, than men who were not working in connection with co-partnership. This appeared to him to be a very great benefit. It had also to be remembered that this was a scheme that put money into the pockets of the men. A very wise point in the scheme was that the men became shareholders in the company concerned; and nothing kept a man from adopting socialistic doctrines so much as having a little property of his own. He saw that there were figures mentioned in the paper connected with his own Company; and he should have liked to have had the comparison carried to a greater number of years. He knew that it was difficult to assess the advantages of any scheme of this sort on a money value. Take the figures in the first table as to the cost of carbonizing labour from 1888 to 1898. His Company (which was practically the same in wages per 1000 cubic feet as the South Metropolitan Company in 1888) increased from 3·34d. to 4·08d. in those years; while the South Metropolitan Company in the same period decreased their wages from 3·27d. to 2·79d.—a very notable figure indeed. If Sir George had gone right up to 1906, he would have seen that the Gaslight and Coke Company had, without the benefit of the profit-sharing scheme, reduced their wages to 2·56d. The South Metropolitan in the same time had reduced to 2·25d. These were both notable results; and in the case of his Company, they had been arrived at merely by the transition from manual labour to successful schemes of mechanically handling coal and coke and other materials. This gain they had made without being in the slightest degree harsh with their men, in whom the Company had every confidence. He (Mr. Goulden) had taken out some other interesting figures with regard to the work done by the men over the period between 1889 and 1906. These showed that in 1889 the Chartered Company, per million cubic feet of gas sold, employed 0·3 man; the South Metropolitan Company, 0·35 man. But he thought they were entitled to assume that just before the strike there was considerable dissatisfaction at the South Metropolitan works. He should therefore look upon the 0·35 as being an excessive figure; he thought that they might take it that it should be 0·3, the same as the Gaslight and Coke Company. Between 1889 and 1906, the Gaslight Company increased in their gas sold by 19 per cent.—a very miserable figure compared with that of the South Metropolitan Company, which was 116 per cent. But, due to the altered methods to which he had referred, during 1906 the maximum per million cubic feet of gas sold had decreased from 0·3 to 0·11 man, as against the South Metropolitan's decrease from 0·35 to 0·10 man. They were again very near. He had also taken out some figures with regard to his Company's present working; and he could safely say that they were rather below the 0·10 of the South Metropolitan Company.

Sir GEORGE LIVESEY: In the retort-house, or where?

Mr. GOULDEN: The whole of the carbonizing work.

Sir GEORGE LIVESEY: You have a great deal of water gas, and we have none. That is where the reduction of labour comes in.

Mr. GOULDEN: That shows our wisdom in having carburetted water gas. [Laughter.]

Sir GEORGE LIVESEY: It vitiates the comparison.

Mr. GOULDEN: I wanted to put these figures in, because the Company show something more favourable.

Sir GEORGE LIVESEY: I am glad you have done so.

Mr. G. R. LOVE (Guildford) said the discussion had been along the lines of large gas-works; and as he believed the scheme was quite applicable to gas-works of a smaller capacity, he rose to support the principles enunciated by Sir George in his paper that day. Their friend Mr. Helps, in giving his figures, had shown a considerable reduction in his carbonizing wages. But he had introduced machinery. In his (Mr. Love's) case, his labour was all hand, and his wages were 2·35d. per 1000 cubic feet of gas made. This, he considered, was very small and very creditable, because his wages per ton of coal carbonized had come down 4d. within the last two or three years. He was not, however, satisfied that this was the lowest figure that could be attained. He had no trouble with his men; they worked very well and very harmoniously. As Mr. Jones said, he (Mr. Love) knew them personally. He went among them, talked to them, and helped them in their troubles. But he believed the figure of 2·35d., by the introduction of a scheme of profit-sharing, would come down still lower, and, not only so, it would give them a far greater interest in the concern than they at present held. He was convinced that Mr. Helps would realize this in his own case. One might look after his carbonizing department very closely, and every gas engineer ought to do that; but there were other men as well as those in the carbonizing department whose wages amounted to just as much as the carbonizing wages. The wages at Guildford inside the works now amounted to about £60 a week; in the outside department, to £52. They could not measure these wages, in the same way that they could the carbonizing wages, at per ton of coal carbonized; and under the co-partnership system, there would be far more incentive to these outdoor men, working away from the eye of the engineer or the superintendent, to be anxious to promote the interests of the concern than there would be without some scheme of profit-sharing. Sir George had also spoken about the total wages paid in a concern; and the total did surprise one. He had himself taken out the figures in connection with his own Company; and their total expenditure for the year was £22,000. They paid for coal and oil over £11,000; and their total wages bill was above £6300. So that, as Sir George said in his paper, the wages did amount to a very high figure. He (Mr. Love) had no hesitation in saying, if this scheme was adopted in his Company, it would result in a considerable reduction in the wages per ton of coal or per 1000 cubic feet. It would help the men to be better men; and for that they as managers had to be responsible as well as for looking after the interests of the shareholders.

Mr. A. E. BROADBERRY (Tottenham) said Sir George had brought to their attention a very ideal state of things; but at the same time he must say that personally he was a little bit disappointed, because he had hoped that Sir George would have indicated some lines by which the advantages to a company could be estimated in £ *s. d.* But it seemed very clear from the paper, and from Mr. Shoubridge's statement as to how the men benefited and how they obtained stock in the concern, that in regard to the advantage to the Company it could only be expressed as a mere matter of sentiment. They all believed that the cheerful worker was a far better worker than the dissatisfied one. [Sir GEORGE LIVESEY: We both believe it and know it.] Nothing, however, was given in the paper by which they could work out for themselves some balance-sheet as to what the advantages were going to be to their companies; and this was Mr. Randall's difficulty as to how engineers were to recommend the system to their boards. He (Mr. Broadberry) had intended to speak on somewhat the same figures Mr. Goulden had quoted; but he (Mr. Broadberry) was not going to allow him to steal the little bit of thunder that he had prepared for Sir George. Some few days ago, Sir George, in connection with the question of the unemployed, wrote to him asking if he could give him certain figures in regard to the maximum number of men employed in gas making in the year 1889, as compared with the output of gas in that year; and the corresponding figures for the year 1906. These figures were prepared and sent to Sir George. A few days after that he was walking round the works with his Chairman (Mr. Corbet Woodall), and his own assistant (Mr. Terrace), when they came across a man who was not doing anything. There was no reason why he should be doing anything at the time, because he was employed on the engines for the coke-conveyors, and the draw had not started. Directly he saw them approaching, he seized an oil-pot, and at once began to grease around. Mr. Woodall remarked upon how peculiar it was that a man always set to work when he saw the manager coming along; and then he turned to Mr. Terrace and asked him whether he found the men were working as fairly and as well as he had ever known them to work before. His reply was "Yes," and that he thought there was nothing of which to complain. He (Mr. Broadberry) told Mr. Woodall of the figures he had prepared for Sir George; and Mr. Woodall immediately asked him how they compared with the similar figures for the Gaslight and Coke Company. He could not say; but Mr. Goulden had supplied the figures that afternoon. Mr. Goulden said that for 1889, the figure of the Gaslight and Coke Company was 0·3 man per million cubic feet, and for the South Metropolitan Company 0·35. For Tottenham it was 0·31. These had come down in 1906 in the case of the Gaslight and Coke Company to 0·11, South Metropolitan Company to 0·10, and Tottenham to 0·09. No doubt Sir George would say that this was because at Tottenham they had so much carburetted water gas; and as Sir George was a quick arithmetician, perhaps he would tell them what the South Metropolitan figures would have been if they had adopted water gas. [Laughter.]

Sir GEORGE LIVESEY: They have found it better to do without it. You know there is always a difference. Your coal is dearer than that of the South Metropolitan; and you cannot compare these things unless the circumstances are exactly parallel.

Mr. CHARLES CARPENTER (London) said he was afraid he was not in the position to respond to the request with which the author concluded his paper; for as one not least familiar with his work, he could not but take this opportunity of publicly expressing, before a meeting of technical men, his admiration of, and faith in, the magnificent structure Sir George had so thoroughly and patiently built. In time to come, when familiarity had bred a forgetfulness as to the origin of much that he had devised to make the supply of gas (he used the term "supply" in its broadest sense) unexpensive and unrestricted, "Livesey's Co-Partnership" would be as familiar in the mouths of the people as household words. Despite all that had been said and written on the subject, he (Mr. Carpenter) felt there were even now many who if asked "What is the Co-Partnership System of the South Metropolitan Gas Company?" would make reply, "Oh, they pay their men a sort of bonus on their wages, or something like that." Such reply would give a very shadowy idea of what their co-partnership really was. He thought that the difference between conducting an industrial concern by the ordinary methods and by co-partnership would be best described as living under autocracy or under autonomy, or let them say under Russian rule or British. He spoke as a works manager of more than a quarter of a century's experience, when he said that the system of management was a bad one which only provided for servitude as a return for wages; and what else did the ordinary employer get from the employed? He got their servitude in return for wages, and, in the vast majority of cases, he got nothing more. Despite the criticisms that had been made, he thought the author's case was proved up to the hilt by the tables given in the paper as to carbonizing wages. They took the carbonizing wages because it gave them an opportunity of being definite in regard to the figures in a manner that several present were so anxious for. He (Mr. Carpenter) ventured to apply the same proof in another direction, and one which he thought worth still more to the Company—especially in these competitive times—than even carbonizing wages. He had in mind the outdoor department, where the percentage on wages that the Company repaid as bonus was even more earnable than it often was in the retort-house. He had many proofs of the goodwill that existed with regard to the men who had been referred to as working in the district, and the number of whom was increasing; for, as the district itself increased, the number of men increased year by year. A little while ago, he saw a gang of water men, a gang of tramway men, and a gang of gas men working on the alterations involved in reconstructing and widening, in preparing for electric traction, an important thoroughfare. The men did not know he was coming; and the only men really doing fair honest work in return for their pay were his own men, and he was pleased to see it. There was another advantage. He had had many proposals from the men for working more economically or expeditiously. These proposals were of various kinds. The last one he had was received only a morning or two previously. One of the men had seen a new combination tap in use on some work by plumbers in a block of dwellings where he was also engaged; and he wrote him (Mr. Carpenter) a letter about the tap, and said, if the Company got some, the men could do their tapping much quicker than now. This was only one example. They had also gained by the use of the inventive faculty which existed in the workmen's brains just as it did in their own. There was nothing special about their own brains compared with those of the workmen. They might be more highly trained, but in co-partnership they had had the advantage of useful work by the brains of the men in the direction of improvement. At one of their works the "Co-Partner Pusher" was originated, which was the simplest pusher he had ever seen. At another works, a man invented a regulator for hydraulic engines; and it was one of the most efficient mechanical devices of the kind he had put to work. He might multiply these examples considerably. The Company's staff varied in number from 5000 to 6000 men according to the season; and as far as what were called labour troubles were concerned, it might truly be said that their affairs were running on ball-bearings. There was such an absence of friction, that this was the only technical term he could think of which described the smoothness with which their machine worked. The result was that, instead of the continual petty quarrellings and bickerings so innumerable with, and so inseparable from, Trade Union control, all concerned in the management had their time clear and their hands free to push forward the Company's business. He had been through the mill, and knew what it was; and he could say it was an enormous relief from responsibility to be able to be perfectly free in regard to dealing with the men, and be able to devote the whole of one's time to business pure and simple. He came back from a visit only a few weeks ago to some of the large German works; and he had been struck with the enormous amount of money that was being invested by the German engineers in labour-saving. The amount of machinery that had been erected there to handle coal and coke and to save men, was so considerable that he asked how it was. The reply was that it was due to the socialistic tendencies of the day; labour being such a trouble and nuisance, they did not care what they spent if only they could do away with it. At the works of the South Metropolitan Gas Company they had visits from influential engineers from America, who told precisely the same story. He was perfectly sure that workmen would not be content with the perpetuation of those labour conditions which came into vogue with the extension of the factory system and joint-stock trading. For himself (and he spoke with a long experience of working men), he could only say they had his sympathy and support in their endeavour to rise out of such a slough. The officials of the South Metropolitan Company knew the old system of management (they were brought up in it); they knew what it was to go through a great strike; and he could speak for his fellow officers and for himself when he said that the more experience they had of co-partnership, the more convinced were they of the great good to the Company it was in all its workings. It was true, as had been said, that they could not put a monetary value on these things. [Mr. Carpenter here read several testimonials to the work of the Company's men in the district voluntarily sent by consumers.] In conclusion, he said that he could only add that the last thing he should be prepared to give up, if he had to give up any of the conditions under which they worked, would be co-partnership. He was reminded that their President was for nearly two years a co-partner; and it would be very interesting to hear from his own lips the estimation he had formed of the system during the time he had had experience of and had participated in it.

The PRESIDENT said he remembered well the two years he had the privilege of serving under Mr. Carpenter in the South Metropolitan Company, and very valuable years they were for him. So far as he could speak of co-partnership, he could only say this: He did not think he ever had an unkind word with any workman (except a drunken man once) the whole time he served the South Metropolitan Company. He had, in fact, never seen pleasanter relations than existed there between the officers and workmen. Several members had asked for some exact statistics by which the advantages of the system could be absolutely gauged. This was asking for rather a lot. Mr. Helps and Mr. Goulden had given them some valuable figures tending to show it was rather difficult to obtain comparisons. It was said circumstances altered cases; and Sir George had said the same. They altered figures as well; and it must be admitted by all that the conditions in gas-works had changed very rapidly in recent years. The members had had valuable testimony from men more capable of speaking on this subject than he was. He was not going to labour the point; but he should like to mention two aspects of the matter which seemed to have been left out of the discussion. Sir George in his paper said: "I go so far as to say that, entirely apart from the financial question, the advantages of co-partnership are such as to fully justify its adoption—nay, rather to make its adoption most desirable, in all businesses and especially in gas companies, where its practicability has been proved." He (the President) thought everybody should look beyond the mere financial gain. It must be clearer and clearer to all every year that the conditions under which labour was employed were varying, and varying very rapidly, and that capital must take steps to meet the change. Mr. Shoubridge had given the most interesting figures he (the President) had ever heard with regard to co-partnership. He said that the 533 workmen of the South Suburban Company who were participating in co-partnership had an average invested of over £50 per man. This must tend to make the Company more stable in every way, and furthermore must tend to improve and strengthen the condition of the nation, because the greater the number of small capitalists that were obtained, the more impossible was made the spread of the pernicious doctrines they heard of in the present day, and which were wrongly called Socialism. Mr. Randall had raised the question as to whether it was fair to penalize the co-partner for the price of coal; and he thought Mr. Jones had replied to him. At any rate, it seemed to him (the President) that co-partnership, if it was to be a success, must be co-partnership in everything. Mr. Goulden had said he thought the test of co-partnership would come in the times of stress. He expected Mr. Goulden was right. In his opinion, no co-partnership scheme could be proved to be an absolute success until it had been tested by a reduction in the amount that was being received by the men; and he understood the first step in this direction had already been taken without any injurious results whatever. The workmen realized that, while they shared in the benefits of the business, they must also share in the losses. If the price of coal or any other commodity went up, to the injury of the workmen, if the workmen were real co-partners, then they should suffer with the whole company. Unless it were so, there would not be true co-partnership. He must say, in conclusion, he felt very proud indeed that such a paper should have been read in the year that he was the President of the Association.

Sir GEORGE LIVESEY, replying to the discussion, said the President and other members who had spoken had already answered a good deal of the criticism. As to the effect of the rise in the price of coal, he had often had this objection raised: "Why should the workmen suffer for something for which they had not been in any way responsible?" The answer was: "Simply because they ought to suffer with the rest of their fellow-countrymen if a disaster or any misfortune came. If the price of coal rose, the consumers and the shareholders suffered, and why should not the workers?" It was of the essence of co-partnership that all should share and share alike. It had constantly been said that under profit-sharing schemes the profits were shared, but not the losses. Under their co-partnership system, they did share losses. In the South Metropolitan Company, the bonus was once reduced

from 5 per cent. to 3 per cent. That was in the early nineties; and in 1900 it was reduced from 9 per cent. to something like 3¾ per cent. In the case of the South Suburban Gas Company, it came down from 6¼ to 2 per cent. Now how did the men take it? They took it as the shareholders did—with perfect equanimity. It was explained to them why it was; and they said they must take the rough with the smooth. The first time the bonus was reduced in the South Metropolitan Company, the Directors were a little bit anxious; but the men said: "We understand it. We see how it is; and we will try to get it back again." That was all. There had not been a word of complaint or objection raised in either Company when the bonus had been reduced. It had been reduced again in the case of both Companies with the rise in the price of gas last July; and the men were perfectly satisfied. Co-partnership should be made as real and intimate as possible; and any circumstances that affected the Company should be shared by all alike—consumers, shareholders, and employees. It must be remembered that the employee shared in the benefit of all economies to which he personally did not contribute. There were certain economies brought about quite independent of the workers which enabled the Company to save money; and the employee shared in them. Mr. Randall had raised a most important question—that was, how to persuade directors to take up co-partnership. He (Sir George) must frankly say, he did not know. If they could bring them to fear that something was going to happen, they would probably act; but they should be shown that co-partnership was not only pecuniarily beneficial both to the man and the Company, but that it also made the workman a better man. It was introduced under the pressure of a great necessity by the South Metropolitan Company. Although it had been mentioned and suggested before, it was not until they were in the grip of the Union that the great necessity arose, and the Board were then unanimous upon action. In the case of the South Suburban Company, there was no necessity; they simply adopted the system. In the case of the Commercial Company, there was an enlightened Chairman and sympathetic Directors like Mr. Jones; and they introduced it, without any trouble in the last two cases, and there would be none now. Mr. Randall spoke of the comparison of the South Metropolitan Company's figures. He (Sir George) did not give these figures with any idea of setting forth the South Metropolitan as a model in respect of anything but co-partnership. There were other companies doing better in many particulars, and they would do better still under co-partnership. As to Mr. Goulden's remarks, the reason he did not go beyond 1898 was owing to the fact that in 1898 carburetted water gas had become so much used that it was impossible to follow out the comparison, because the labour cost of making carburetted water gas was not given. He took the years in question, because he believed the circumstances of the three Companies were then very similar. They all began to introduce machinery from 1889; and he did not think there was much difference in the relative proportion of machinery adopted. But whereas in the other two Companies the high cost of carbonizing remained for several years, the South Metropolitan Company began to drop immediately; and he thought he was comparing periods not that differed in conditions, but which were alike. When they got to the question of water gas, it made a considerable difference. He did take out the figures for 1906, by correcting as far as he was able the Gaslight figure of 2·56d. He found there was 22 per cent. of carburetted water gas made by the Company; and he estimated as well as he was able how much labour was involved in that. His calculation brought out that the labour cost on coal gas was appreciably higher than the 2·56d. given in "Field;" and he purposely left it out. As to his friend Mr. Helps, he was sorry if he interrupted him; but he did feel that what was done at Croydon had nothing whatever to do with the question of comparison, because it did not follow that the Croydon machinery and carburetted water gas were in the same proportion as the South Suburban. The figures in the paper only dealt with the South Suburban Gas Company compared with itself, and with the conditions the same. When he got further on—beyond 1901, he could not follow out the relative conditions; so he did not pursue the comparison. Mr. Helps said if the men showed any inclination in this matter, he would bring the matter before his Board for consideration. The inclination must come from the employer. The men were not likely to show any inclination or to ask for the system; and he (Sir George) did not quite see how they could do so. The initiative must come from the employer; and he should have the credit of it. If the initiative came from the men, they might say: "Well, we are entitled to all the benefit that accrues." If the initiative came from the employer, and he worked it, he (Sir George) thought he was entitled to at least an equal pecuniary benefit. Then about the weeding out of the men. The great difference in their system from the ordinary one was that the latter had to weed out the indifferent men, while the former had to convert them into good men. This was what had been done in numberless cases. When they began, more than half the men were thriftless. They wanted their money to spend year by year. By patience and perseverance (and here he could not speak too highly of the spirit in which the officers of both Companies had acted in this matter, not only Mr. Carpenter and Mr. Shoubridge, Mr. Bush and Mr. Ohren, but all the other officers, subordinate ones as well), they had made the men feel they were their friends; and the result had been given by Messrs. Jones, Carpenter, and Shoubridge. The men who had only a small amount standing to their credit were the indifferent and the thriftless at the start; but at length they began to get as thrifty as the others. Instead of 50 or more per cent. of the men withdrawing their money, they now all put it into stock. They converted indifferent men into good ones. As to the agreements terminating at various times, the men liked it; and why should the Companies make all the agreements begin (say) on Jan. 1 and end on Dec. 31? This would be simply inviting the enemy to come in and attack them. The men themselves were quite satisfied, and were very glad to be protected against any outside attempts to interfere with them. As to such outside attempts, he might say that, as for anything like fear existing, it really made one laugh to think of it. They had no fear of any trouble; and he did not see how it could arise. Mr. Bell spoke of the railway settlement and of arbitration. This was a vastly different thing. There was to be in that case an outside arbitrator, and Conciliation Boards were to be formed; and the Union meant to have a big finger in that pie. Mr. Bell's namesake had said that most of the men who were elected on the Conciliation Boards would be members of the Union; so that on the Conciliation Boards there would be two opposing sides. On the Co-Partnership Committees there was no division—all acted in the same spirit, and all the men were interested as shareholders in the Company. He did not know how a corporation could arrange for their men to invest in their stock. What they of the Co-Partnership Companies said was that co-partnership was infinitely better than profit-sharing. He did not think directors were hopeless; and he thought, if it could be put to them, they would see that this was not merely a question of money-saving—that consideration only of money-saving, although a fact, was putting the question on the lowest ground that could be selected. In addition to any pecuniary advantage in the system, there was something higher and better—that was, the cultivation of the brotherhood spirit, and the cultivation of it in a manner that would tend very largely to do away with many of the evils from which the country was now suffering. If they had this spirit prevailing among the employers and employed everywhere, the state of things generally would be vastly different from what it was now. As to investing the bonus, there was no difficulty at all about this. All the three Co-Partnership Companies in London had to buy stock in the market. If they happened to be issuing new stock at the time, a portion was reserved for the employees. He agreed with Mr. Goulden that the best way was not to wait for trouble before making preparation for it. This co-partnership was a greater thing than £ *s. d.* It would secure a better distribution of property; it would give a lasting and permanent peace; and it would work a great good for the men. It gave them hope where they had not hope before; and, carried out to its fullest extent—by electing workmen to sit on the Boards of Directors (which had been a great success in the South Metropolitan and the South Suburban Companies)—it put responsibility into the hands of the men. He earnestly hoped the gas industry would thus confer a benefit on the community greater than even all the inestimable benefits that it had conferred in the last hundred years.

A paper was then read by Mr. J. Tysoe, of East Greenwich, dealing with (1) a new method of repairing gasholders, and (2) the use of burnt spent oxide of iron in gas purification—see opposite page. At the close of the discussion on the paper,

Mr. Charles Hunt proposed a very cordial vote of thanks to the readers of the papers. With regard to Sir George Livesey's masterly exposition of the principles and practice of the co-partnership system, it must have occurred to them all that the Association were particularly fortunate in having had this contribution. He was sure it would rank among the most valuable contributions offered to the Association. He hoped it would do much more than this. He hoped it would mark a fresh era in the history of the movement. He was sure Sir George's purpose would not have been served if they did not carry with them the principles he had endeavoured to inculcate, and put them into practice by extending the system. Those who had not already tried the system should decide to do so. They would never repent it. He had had considerable experience of it now, and, as they knew, he had also had long experience of other systems; and he could bear testimony—if any testimony were wanted—to the good feeling and the hearty goodwill which it promoted. Mr. Tysoe's paper was of a somewhat different character. It was of an essentially practical nature, such as always commended itself to meetings of gas engineers. He (Mr. Hunt) was particularly interested in his account of the use of burnt oxide; and it seemed to have opened a new idea in the economy of purification. He hoped they might hear more of the use of this burnt oxide, which had hitherto been regarded as a waste product.

Mr. T. Glover (Norwich), in seconding the motion, congratulated the members on having secured Sir George to read his valuable paper to them. It was a great thing to have a captain of industry come forward to expound his ideals and give the result of practice. The second paper was an illustration of the fraternity that existed among gas men. No sooner did a man find out what would benefit the gas industry, than he was willing to come forward, and give his friends the benefit of it. This burnt oxide had been known to at least one firm in this country for about ten or twelve years; but they were not likely to themselves let the gas industry into the secret, seeing that it was an important business for them. It would be advantageous in the cause of economy that the material should be brought into use again.

The motion was heartily passed.

TWO NOVELTIES IN GAS-WORKS PRACTICE.

NEW METHOD OF REPAIRING GASHOLDERS—USE OF BURNT SPENT OXIDE OF IRON IN GAS PURIFICATION.

By Joseph Tysoe, of East Greenwich.

[A Paper read before the Southern District Gas Association, Nov. 14.]

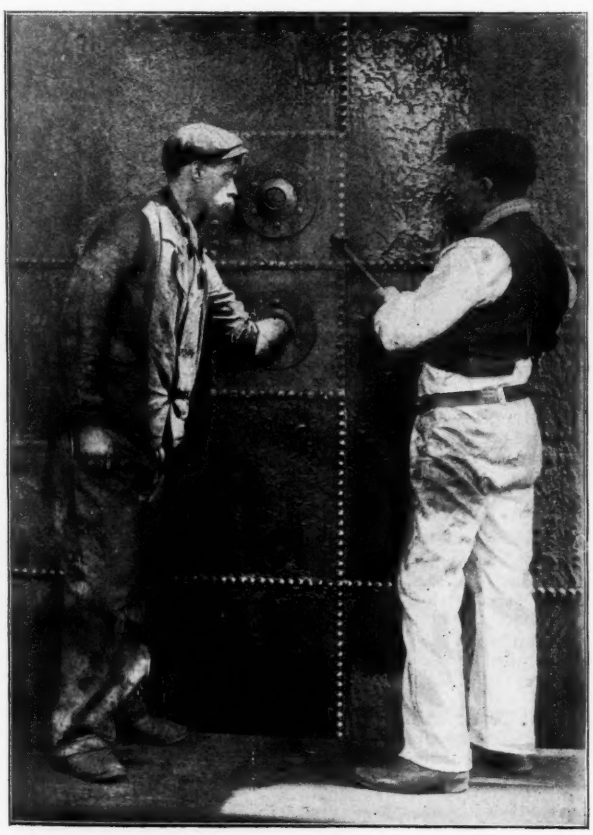
When approached by our Honorary Secretary on the subject of the provision of a paper for this meeting, I unfortunately gave him a choice of either of two subjects on which I was prepared to offer a few observations. Modesty, where he considers the interests of the Southern District Association are involved, is evidently not a part of his nature, as he promptly informed me that he would have them both. This explains how it comes about that my paper deals with subjects so wide apart as "A Novel Method of Repairing Gasholder Sheeting" and "The Use of Burnt Spent Oxide in the Purification of Gas from Sulphuretted Hydrogen."

Repairing Gasholder Sheeting.

The method in vogue for repairs to the sheeting of gasholders is one with which you are all familiar, and needs no description from me. I will merely say that it consists in fastening a patch on to the sheet to be repaired, secured by T-headed bolts, which are screwed up by means of a nut on the outside. A joint more or less tight is the result, accompanied by the aforesaid nuts and a portion of the bolt protruding through the same, which are not added attractions to the appearance of the holder.

During the summer, the question of repairs to one of our holders came to the front; and one of my foremen made what I considered a very original suggestion with regard thereto. I thought the idea merited encouragement and assistance, which were duly accorded; and the repairs were proceeded with on the new lines, and the result has been very satisfactory.

The actual appliances used are brought for your inspection, and these, added to my description of them, will no doubt make the *modus operandi* quite clear.



The novelty of the idea consists in the riveting on of a new plate after cutting out the defective portions, with little or no loss of gas. In the first place, a sheet of rubber or other suitable material is introduced into the inside of the holder, by passing it down and under the dip-plate of the lute, or in the case of a single-lift holder by passing it under the curb—the holder, of course, being lowered or raised to a position suitable for carrying out these operations. The sheet is suspended by lines passing through holes drilled in the lute immediately over the spot where the patch is to be placed. With a specially-made tool, a hole, 8 inches in diameter, is cut in the sheet to be repaired; and when the piece is removed, the pressure of gas on the rubber sheeting closes the hole and no gas escapes.

The patch which it is proposed to put on is provided with what I call a gas-lock, constructed as follows: A 5½-inch diameter hole is cut in the patch, and the edge of the hole inside is strengthened by a wrought-iron ring, 1¼-inch by ¼-inch thick, riveted to it. The lock is formed by two wrought-iron rings, 1¼ in. by ⅛ in. by 4½ in. diameter, between which are placed a rubber seating with a 2¼-inch hole, and a rubber flap or valve, which closes the hole when the pressure of gas comes against it. The two rings are riveted together and fastened to the plate forming the patch with studs. The plate, with rivet holes previously punched round the edge, is then placed in position. Before drilling all the corresponding holes in the gasholder sheeting, two or three (just sufficient to hold the plate in position) are drilled, and the temporary bolts are inserted, which are passed through from the inside by means of the hand and arm, which can be inserted in the gas-lock—the gas being prevented from escaping by the rubber seating, which grips the arm closely but does not prevent its free action. The nuts are put on outside, and the remainder of the holes are then drilled.

Preparatory to riveting, a bolt is placed in every fourth hole, and screwed up; the remainder of the holes being temporarily filled with a wooden peg, or a plug of soap, or other suitable material. To effect the riveting, another small hole is drilled in the top of the lute-dip, or in the crown in the case of a single-lift holder, through which a cord is passed, one end of which is lowered inside the holder and brought through the gas-lock. A riveting-dolly is secured to this; and the dolly is passed through the lock, and its weight is supported by a man who holds the other end of the rope, which is brought down to the ground for the purpose. The holder-up has simply to hold the dolly in position on each rivet head, while the point is riveted and finished on the outside. In inserting and withdrawing the arm from time to time during the riveting, the flap-valve closes automatically, and practically no gas is lost. On completion, the gas-lock is removed by taking out the studs which secured it, and a circular plate of somewhat smaller diameter, but with identical stud-holes, is substituted, and is secured with countersunk studs, in order to give a neat appearance. During this operation, escape of gas is prevented by the rubber safety-sheet, which is afterwards drawn up and removed through the lute when the gasholder has been lowered sufficiently for the purpose.

It sometimes happens that a gasholder plate is wasted over a considerable portion of its area. A patch of large dimensions is then required; and it will be found necessary to have two holes in the patch, each provided with a gas-lock, in order that the extremities may be reached by the inserted hand. So far the largest size that we have dealt with has been 3 ft. by 2 ft. 6 in.; but I should not hesitate, were it necessary, to cut out a whole sheet, in which case the procedure would be somewhat different. It would be necessary to employ a rubber sheet rather larger than the plate, and to stiffen it with a few wrought-iron bars fastened to it in a vertical position. When the sheet is in place, the holder would be lowered until the lower edge of the plate to be removed is under water, when the horizontal row of rivets would be cut off. As the holder sinks, the other rivets would be cut off as they became submerged. When the whole plate is removed, it would be used as a template for punching the hole in the new plate, which would be provided with the necessary

number of gas-locks. This plate would be put in position below the water-line and secured with temporary bolts; and the riveting would then be done as described in the case of a patch.

By repairing a holder in this manner, the heavy expense and inconvenience of putting it out of action and emptying the tank may often be avoided; and in the case of a small repair only being required, which could be done in the ordinary way while the holder is inflated, this method ensures a better joint and a more presentable appearance.

Burnt Spent Oxide for Gas Purification.

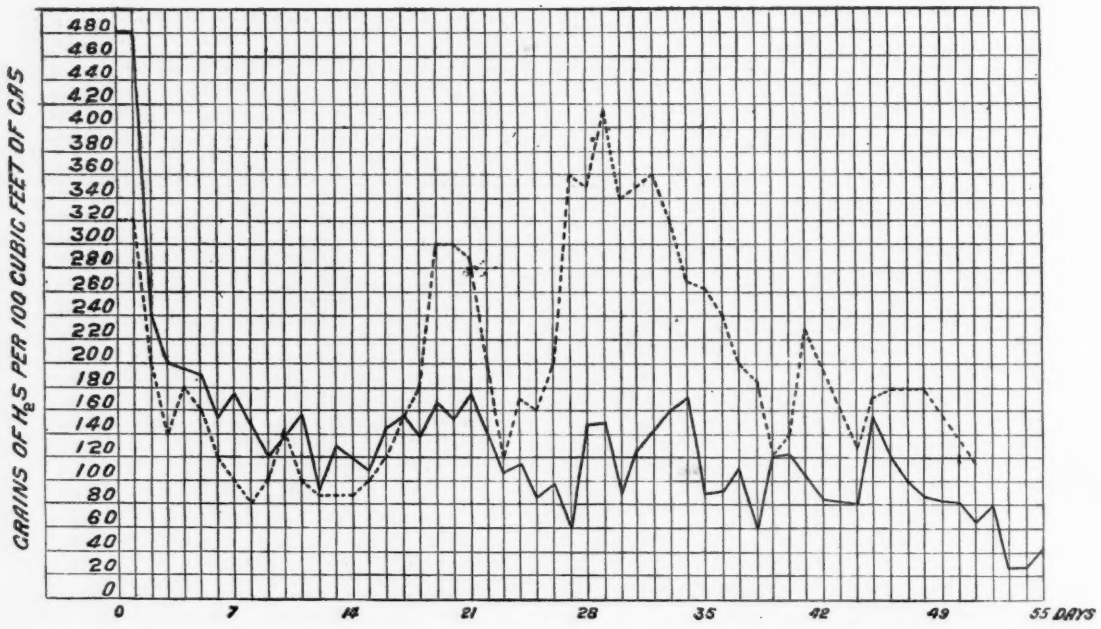
The second portion of this paper deals with the use of burnt spent oxide for the purification of gas from sulphuretted hydrogen. In works where sulphuric acid is produced from spent oxide of iron, there must necessarily be a large production of burnt oxide. To this material no value has hitherto been attached, so far as I am aware, and it has been a waste product, for which no use could be found.

At East Greenwich we manufacture sulphuric acid from spent oxide on rather a large scale. Consequently the burnt residue is considerable, amounting to about 30 per cent. of the oxide burnt; and the question of its disposal was one of some moment. Knowing that the amount of ferric oxide in the material was high —being about 60 per cent.—it occurred to me about three years ago that it would be interesting to ascertain what its action would be in a purifier. I was aware that it was generally assumed that the iron was in an anhydrous condition, and consequently its action on sulphuretted hydrogen would be very slight; and I have been told by chemists that the only way to bring it into a condition suitable for gas purification would be to dissolve it in hydrochloric acid, and precipitate with ammonia. This method of treatment was out of the question, as the expense involved would be too great.

Knowing that theory and practice do not invariably go hand in hand, I made the experiment with the material without making any attempt to alter its chemical composition; and its action was of such an encouraging nature that the experiments were continued. The result is that at the present time not a pound of the 2000 tons of burnt oxide yearly produced at East Greenwich is thrown away; and more than half the gas made there is purified by it alone. It has been supplied to other stations of the Company, where it has been equally successful; and the demands for it exceed the supply.

But little preparation is required to bring it into a condition for use in the purifiers. It is simply mixed with about 25 per cent. of sawdust, and well wetted. It is then ready for action. When used in the last box of a series, its action on the small amount of sulphuretted hydrogen usually found in such a position is very slight. In this respect it much resembles the action of the new bog ore, which works better when fouled to the extent of 5 or 6 per cent. of sulphur.

The best position for either burnt or new oxide is first in a series, when it is subjected to the action of gas containing 500 to 600 grains of sulphuretted hydrogen. But in a set worked in rotation it is not at all times convenient to employ it in this position. At East Greenwich, one set of purifiers has a box on the inlet, which can be worked or shut off without in any way interfering with the rotation of the following boxes; and this box I set apart for preparing the new burnt spent material for use in the ordinary way. This box is kept at work till no more sulphuretted



hydrogen is absorbed; and it is then emptied and the contents distributed among the other purifiers. Sometimes this first exposure results in an addition of 1 or 2 per cent. of sulphur only to the material; and the highest amount absorbed has been 33 per cent. This variation is, no doubt, due to the varying percentages of hydrated oxide contained in the material.

The accompanying table, taken from the works' records, may be interesting :—

Sulphur in Oxide When Put In.	Sulphur in Oxide When Taken Out.	Increase.	Gas Passed. Millions.
0·8 ..	4·4 ..	3·6 ..	42
1·0 ..	6·1 ..	5·1 ..	48
1·2 ..	2·7 ..	1·5 ..	25
6·6 ..	12·5 ..	5·9 ..	64
0·9 ..	4·2 ..	3·3 ..	20
1·0 ..	15·0 ..	14·0 ..	213
0·9 ..	9·4 ..	8·5 ..	341
2·1 ..	35·3 ..	33·2 ..	93
0·9 ..	26·8 ..	25·9 ..	196

The table shows a remarkable difference in the activity of some of the boxes. In one case 8·5 per cent. of sulphuretted hydrogen was absorbed from 341 million cubic feet of gas; and in another 33·2 per cent. from only 93 millions. The weight of oxide in each purifier was about 190 tons. I am not prepared to explain the reason for this variation; but it is not improbable that the amount of ammonia present in the gas may have something to do with it. And, again, its condition may be affected by the application of the water used in quenching the oxide. The oxide when withdrawn from the shelves of the burners is red hot; and if quenched immediately it is not unreasonable to suppose that the effect would be different from an application of water after it had become comparatively cool.

I have prepared a diagram in order to show the working of the first two boxes in which burnt spent oxide was used in the latter end of the year 1904. The first is indicated by the red line; and 60 tons of material were used in one layer 14 inches thick. This worked for about two months, and passed 120 million cubic feet of gas, and absorbed 20·3 per cent. of sulphur. On the sixteenth day, about 1 per cent. of air was introduced, the effect of which is very apparent. The air was continued for two days; and then stopped and again put on—its action the second time being still more marked. Through the second box, 168 millions were passed with two layers each 12 inches thick; and only 11 per cent. of sulphur was absorbed. For the first 24 hours, 480 grains of sulphur were taken out; but this action rapidly diminished, and thereafter it varied only between narrow limits during the two months in which the box was at work.

Mr. Tysoe, at the close of the paper, remarked that the air in question was put in under pressure, and not under vacuum. He had an engine working a small exhauster. Air was pumped into any box in the series; and they had complete control of it in this manner.

Discussion.

Mr. P. E. Williams (Poplar) said the second novelty in Mr. Tysoe's paper was very interesting, and one could not but regret that the use of burnt oxide for purification had so long been neglected, and many thousands of tons of useful material wasted. It was a coincidence that experiments as to the suitability of this material for use in the purification of gas from sulphuretted hydrogen were being carried out at the Poplar works at the same time as at East Greenwich. Mr. Tysoe was exceptionally fortunate in having a box available for experimental work; and in bringing this "novelty" to their notice, he had done the gas industry, and incidentally the acid manufacturer, a useful service.

In many districts the material could be purchased for very little; and there was no reason why at least 75 per cent. of the gas made should not be purified by means of this hitherto comparatively useless material. At Poplar the first experiment was the passing of a portion of the waste gases from the sulphate plant through the burnt oxide suitably prepared and made alkaline. This was completely successful; and an oxide very rich in sulphur was ultimately obtained. However, they did not charge a purifier with the burnt oxide until October, 1905, soon after the happy removal of the objectionable restrictions as to sulphur compounds. About 150 tons were used. As the material was slightly acid, it was decided to bye-pass the scrubbers for four hours, during which time no ammonia could be detected on the outlet. The absorption of sulphuretted hydrogen for the first few days averaged 130 grains. It was then put to work as the fourth vessel in a series of five. When the sulphuretted hydrogen came along, it at first did very little, but every day they noticed that the absorption of sulphuretted hydrogen increased, ultimately removing, when the box came into position as first in the series, 450 to 500 grains. When discharged this summer, analyses of the five tiers gave the following results:—

Sulphur (Dry Basis).

	Per Cent.
Bottom tier	38·40
[NOTE.—This bottom tier was bye-passed on account of back-pressure.]	
Second tier	51·83
Third ,,	31·90
Fourth ,,	27·60
Top ,,	16·84
Average	33·30
Average percentage of ammonia	0·51

It was hard work digging out the spent material, and, to prepare it for further use, it was ground in a mortar mill, mixed with a little more sawdust, watered, and put back into the same box. It was still doing good work. A second box was charged in April, 1906. In this case the material was made slightly alkaline by means of caustic soda solution. This method did not prove so successful, and the material had to be sulphided four times before it was sufficiently rich in sulphur to be sent to the acid plant. The first sulphiding gave 3·49 per cent. of sulphur, the second 22·04, the third 41·24, and the fourth 46·85 per cent. In each case, the box was put on first in the series. The use of ammonia for increasing the activity of the burnt material was not to be recommended, for obvious reasons. A method equally good was to wash the burnt oxide with water until it was neutral. The material treated in this way gave (on the dry basis) after the first sulphiding 5·26 per cent. of sulphur, after the second 13·92, the third 48·3, and after the fourth 59·4 per cent. These were similar results to what one would expect from ordinary bog ore. The variation in the amount of sulphuretted hydrogen absorbed was, he thought, due to the varying amounts of iron sulphates in the burnt oxide, or to varying amounts of ammonia in the gas—the former retarding, the latter assisting, the absorption. The burnt oxide quenched in the ordinary way, was always acid; and it had been observed that if this was made slightly alkaline, and exposed to a stream of coal gas containing much sulphuretted hydrogen and little ammonia, the material again became acid and absorption ceased, or practically so. He had recently found that, by drawing the red hot burnt oxide from the shelf of the burner into boiling or very hot water, the latter at once became slightly alkaline. This seemed to be owing to the presence of lime in the spent oxide, appearing in the ash chiefly as sulphate. The burnt oxide, after treatment with boiling water in the way mentioned, appeared to be much more active in removing sulphuretted hydrogen than that quenched in the ordinary way and treated with an alkali.

Mr. S. Y. SHOUBRIDGE (Lower Sydenham) said the author was to be congratulated upon the ingenious mechanical arrangement he had devised for repairing gasholders. Not only had he invented a successful lock, but he had had the goodness to give the members the key to open it.

Mr. TYSOE (interposing) said he did not claim it as his invention. One of his foremen made the suggestion.

Mr. SHOUBRIDGE: At any rate, you have given us the key. Continuing, he said he also wished to say that, having heard from Mr. Tysoe what he was doing with his oxide, he asked him to send him a small portion. He put it into one of the purifiers on March 15; and it was removed on May 23, when it was found to have taken up 20 per cent. of sulphur. It was put in again on June 8, and removed on Oct. 8, when it was found to have absorbed 15½ per cent., which showed that it was very active indeed. He found it had then been put on one side, because it wanted some breaking up; and therefore he could not give any further figures in regard to it. He thought the tests already made showed that it was a valuable purifying agent; and they were greatly indebted to Mr. Tysoe for finding out a cheap means of giving them oxide.

Mr. J. N. REESON (Beckton) said that perhaps his experience with the use of burnt ore in connection with sulphuretted hydrogen purification might be of interest to the members. He believed it was during the latter part of last year that he heard from a manager of one of the great coking companies in South Wales that he had been experimenting with burnt ore with the object of testing it simply for gas purification; and as he was naturally only too anxious to adopt, or make use of, any hints he heard, he immediately made some experiments with burnt ore. He might at once say that his difficulty had been to obtain burnt ore of constant and satisfactory composition. He found the burnt ores varied in composition to a considerable extent. Hitherto he had been unable to satisfactorily account for their absorptive power for sulphuretted hydrogen. But a few notes might very possibly throw some light on the subject. In the first place, he should like to give an analysis of a representative burnt ore as they received it. The moisture was about 5 per cent.; the ferric oxide about 35 per cent. (this was presumably anhydrous); the ferrous sulphate was 31 per cent.; and the silica, lime, and organic matter made it up to the 100. He suggested that the reason for this material being active in the removal of sulphuretted hydrogen was not so much on account of the ferric oxide it contained, but on account of its being treated with ammonia. He thought ammonia was a most important neutralizing agent; and on its being neutralized with ammonia, the ferrous sulphate was converted into ammonium sulphate and ferric hydrate. He suggested this was the reaction that went on in the purifier, and this was the reason that Mr. Tysoe found the vessel worked so much better in the first position than in the subsequent position of a series. His own experience was absolutely identical. It was due to the ammonia being present, rather than to a large amount of sulphuretted hydrogen. Of course, the rest of the formulæ of the reactions that took place with sulphuretted hydrogen were very well known. With regard to the behaviour of burnt ore, it had been his practice not to mix any sawdust with it, but to use it straight as it came from the kilns after treating it with weak liquor. In one case a box, containing 60 or 70 tons, was working four months without being opened. At the end of the four months, 1 per cent. of air was introduced. It was only removed because of the pressure the box was throwing; and it was found to contain 30 per cent. of sulphur. This was, of course very gratifying; but on the material being shot out of the vessel, it at once spontaneously fired. It was in a state of fine subdivision, and that was one serious disadvantage—it was so extremely active. There was another thing that caused them some anxiety in the behaviour of the vessel. They found that, from this box, the sulphur compounds—the bisulphide and so on—increased to an abnormally high degree; and he put this down to the oxidation through the small amount of air that was introduced into the vessel. This was a serious disadvantage; and for some months they had to put the vessel out. The use of the material was quite well worth some further trial. The method of holder patching Mr. Tysoe showed was extremely simple, and apparently effective. But he had been wondering how he got his india-rubber washer underneath the grip plate, on a holder of many lifts, when he wished to repair the top lift. He, of course, knew it depended on the length of the seal; but if he had a hole underneath with a seal equal to the length of a man's arm, it would be impossible to insert the washer.

Dr. H. G. COLMAN (London) said, with regard to the utilization of burnt oxide, he understood that, although nothing had been published about it, it had been used in many cases. It had been employed in the United States—more especially in New York. Mr. Reeson had made one remark he was himself going to make. He had given an analysis, and said that probably it was the basic ferric sulphate contained in the spent oxide that, after neutralization with ammonia, largely formed the active substance when the burnt oxide was used. It had long been known that an ignited iron oxide only absorbed sulphuretted hydrogen very slowly indeed, and, in order to be at all active, it must be in the hydrated form; but he should like to ask whether Mr. Tysoe had made any experiments as to the effect of different methods of quenching on the activity of the oxides. He mentioned that possibly this had something to do with it; but he did not gather that Mr. Tysoe had made any direct experiments—such, for example, as the difference between quenching the oxide quite slowly in a vessel with steam or pouring water on it. It might have an effect on the initial activity of the oxide, which was the *crux* of the whole thing. After it had been used once or twice, there was no difficulty—the difficulty was the first time. With regard to another point that had been mentioned by Mr. Williams, the burnt oxide was acid. Now, it had been recently shown by one of Dr. Bunte's assistants that, if sulphuretted hydrogen acted on the iron oxide in a neutral or slightly acid condition, there were certain troubles met with. Oxide of iron, in ordinary gas-works practice, was slightly alkaline, because a trace of ammonia went forward, and the sulphide of iron formed was ferric sulphide corresponding to ferric oxide, which readily oxidized in the air and re-formed ferric oxide. If the mixture was slightly acid, they might get iron pyrites formed, and this compound only underwent revivification very slowly on exposure to the air. In using burnt oxide of this kind, the question of acidity would have to be borne in mind, and some means would probably be taken to neutralize the ferric sulphate by utilizing the ammonia of the gas, or by other means, in order to prevent this acid reaction. It was true the ferric sulphate might not be itself acid; but directly it came in contact with the sulphuretted hydrogen, small traces of sulphuric acid would be found.

The PRESIDENT said that the members were all grateful to Mr. Tysoe for his paper on two most interesting subjects. They had, he was sure, gained considerably by listening to him.

Mr. TYSOE, in reply, said that it had come to him quite as a surprise that other people were using burnt and spent oxide to

the extent they were doing. Mr. Williams had told him he had been using it for some time; but he gathered from what he said that he started using it some twelve months after he (Mr. Tysoe) began. Mr. Reeson also told them that he was experimenting with it. It had got beyond the experimental stage with him (Mr. Tysoe). It was used, and used effectively, and equally well in many cases to new bog ore—in some cases, indeed, the results were better than they realized from new bog ore. At one of their stations, the Engineer told him he had used 100 tons of it. The bog ore was stored at the East Greenwich station; and the engineer referred to asked that burnt ore should be sent to him in preference to new. With regard to the question of ferric sulphate, he was very glad to hear Mr. Reeson's remarks on this point, because he (Mr. Tysoe) had some doubts in his mind that the ferric sulphate in the oxide of iron would prove somewhat of a nuisance in time. He was glad to learn that probably it would not be so. His fear was that, on reburning so many times (the spent oxide was sent over to the acid works, burnt there, and brought back to the purifiers), possibly the ferrous sulphate in the oxide would not be affected by the heat of the burners, and if it remained in it, it would be an increasing quantity. He was relieved to learn that the action of the ammonia broke up the ferrous sulphate. He hoped this would prove to be true, and that their alarm with reference to the increasing proportion of ferrous sulphate would be groundless. Regarding Dr. Colman's inquiry as to whether he had experimented with different methods of applying water, he had not done so. He proposed to experiment in the preparation of it by cooling the oxide of iron immediately it came out and after it had been out some time, and noting the effect and any other results therefrom. It occurred to him that this might possibly have had some effect on the action of the oxide; and he gathered from Dr. Colman that he quite agreed with him—that there was possibly something in it. They quenched the material by simply pouring water on to it from a hose-pipe as it came out. Those who had seen it, knew that it was almost like liquid fire; and it was very difficult to put out. With regard to the rubber safety sheet, Mr. Reeson asked a question as to how it was introduced. It was a perfectly simple matter. Whichever lift it was desired to repair, was lowered into the tank, and the lift above it was lowered a few inches, so that there was room to get underneath the grip. A hole was previously drilled in the top of the grip, and a cord was passed through and fastened to the sheet; and the sheet was then pushed back underneath the grip and dropped down inside the holder.

SCOTTISH JUNIOR GAS ASSOCIATION.

EASTERN DISTRICT.

A Quarterly Meeting of the Eastern District Section of the Association was held in the Heriot-Watt College, Edinburgh, on Saturday afternoon—Mr. D. Bisset, of Edinburgh, the President, in the chair. There was a better attendance than usual.

The President introduced Mr. J. T. Wight, of Edinburgh, who, he said, it would be in the members' recollection, gave them an interesting paper last year, on "Suction Gas-Producers."

Mr. Wight then proceeded to read a paper, which was profusely illustrated by lantern slides, on the subject of

HYDRAULIC MACHINERY IN THE WORKSHOP.

The author said the paper was not very much connected with gas making, but he nevertheless hoped it would be interesting. In the term "hydraulic machinery," they should, strictly speaking, include only such machinery as that in which the source of motive power was water at a high pressure, or, in other words, machinery acted upon by water, in contradistinction to that which itself acted upon water. Such a restriction, however, was not always convenient or advantageous; and, for the purposes of the paper, it would be better to waive any such distinction, and include brief descriptions of both types of machines. He divided machinery operated upon by pressure of water into three classes, defined, according to the intensity of the pressure at which they worked, (1) low pressure, working up to 200-lbs. per square inch, suitable for hotel lifts and warehouse hoists; (2) medium pressure, working at from 400 lbs. to 1500 lbs. per square inch, suitable for hoists and for riveting; and (3) high pressure, working at from 1 to 10 tons per square inch, suitable for oil and baling presses and pinching-bars. The majority of workshop machines were operated at only medium pressure. As to high-pressure machines, though they were, in some respects, advantageous, yet, for permanent machinery and plant, pressures greater than 2 or 3 tons per square inch were hardly to be recommended. In small machines, where portability was a consideration, pressures of 4 tons per square inch might be used with a fair amount of success; but unless the conditions were compulsory, it was not advisable to exceed 3 tons per square inch. The reason for this lay not so much in the fact that it was difficult to design sufficiently strong cylinders, and ensure tightness of joints, but in the high resulting velocity of the water under these pressures, coupled with the peculiar erosive action of water travelling at high velocity. With a pressure of 10 tons per square inch, the discharge into a vacuum worked out at a little over 1800 feet per second; and if the water should contain any grit, however minute, the action approximated to that of a sand-blast—conditions under which it was impossible to keep valves and seats in good order. Even with 2 tons per square inch, they had a velocity of 800 feet per second, which was quite sufficient to cause erosion if once a small current was started. It was therefore imperative that all water for power purposes should be passed through some form of filter before reaching the pumps.

Hydraulic machinery did not figure so largely in the machine-shop and foundry as it did in steel and boiler works. It was being hard pressed in both of these departments, consequent upon the rapid advances that were being made by electricity and compressed air. Still, for operations requiring smoothness and precision, backed by considerable force, there was nothing to touch hydraulic power. The price compared favourably with other powers. The mechanism, though massive, was very much simpler than that of the many systems competing against it. The operations in which it was difficult to find a rival to hydraulic power were in heavy lifting gears, the moulding of heavy work, bending, joggling, forging, stamping, and press work. In both machine-shop and foundry, possibly the most general application of hydraulic power was for lifting gears. In the matter of fixed lifting gears, the steady solid water pressure, capable of minute adjustment, the steady push or pull without the intervention of gear, and the absence of noise, all tended to make hydraulic power an ideal agent. It was not suitable for overhead travellers; but in this sphere, where it was used for serving heavy boiler-riveting plant, where the motions of translation were comparatively small, it had no real rival. As showing the efficiency of hydraulic machinery for lifting work, the author stated that the Luxor Obelisk in Paris required 480 men to raise it, whereas Cleopatra's Needle, in London, which, he understood, was much heavier, was raised by four men only, with the aid of hydraulic machinery.

Discussion.

Mr. J. Dickson (Kelty) asked as to the best method Mr. Wight would advise for the filtering of water. Some time ago he had to employ hydraulic power, and it was found very difficult to keep grit out of the water used for the pump, and not only grit, but packing from the pump-glands, which made its way through into the overhead tank.

Mr. Wight replied that the usual method was to send the return water through a copper rose into a hose, in which they had a series of perforated zinc plates.

The President remarked that Mr. Wight had given the members a history of the science of hydraulics, as well as a full description of the plant used, and how it was applied to machinery in the workshop. They were, perhaps, just a little disappointed that he had not touched specifically on its uses in gas-works. In the larger works, they found hydraulic machinery extensively employed—as, for instance, for the tilting and emptying of railway waggons, for waggon capstans, and for cranes. It had also been largely used in the Arrol-Foulis charging and drawing machines for horizontal retorts. At the Granton Gas-Works, it had been successfully introduced for operating the valves in the coal-measuring chambers, allowing the charge of coal to drop into the retort. Mr. Wight had told them of a variety of uses to which the silent power of water had been put.

QUESTIONS DISCUSSED.

The President said they had now to discuss the questions submitted by the Council. The first was:

The relative advantages and disadvantages of a general high-pressure system compared with individual installations.

Mr. J. Dickson (Kelty) considered the question an opportune one. He thought it behoved them to supply gas at such a pressure that consumers would not require to instal, at their own cost, apparatus for raising it in their own premises. What limits could be put upon high pressure? They should designate low pressure as 30-10ths and below it; moderate pressure up to 60-10ths; high pressure at 1 lb. per square inch and above it, up to 20 lbs., as they had in America. He should say a moderate pressure of 6 inches on all mains would only be economical where the consumption was between 2 and 2½ million cubic feet per mile of main. There might not be any great advantage in supplying gas at 6 inches pressure, as the leakage would increase; but it would be useful for the supplying of an outlying district, perhaps two miles from the works. The gas could be sent through the pipes at the pressure named, and then reduced locally to the normal pressure. In larger towns, high pressure might be used to supply high-pressure lighting, in order to prevent consumers putting in high-pressure installations themselves.

Mr. W. Williamson (Leven) considered high-pressure supply would be chiefly useful for taking gas to a neighbouring district, where the pressure could be reduced to the normal before the gas was sent out to consumers. In his district there were two or three towns which might be supplied in this way. The Company had not yet been asked to give these places a supply, but the subject was under consideration.

Mr. W. Brown (Lasswade) thought there was at present a difficulty in the way of high-pressure gas supply, in the fact that in most of their works the pipes in use had not been laid with the intention of delivering gas at a higher pressure than was usually thrown on the pipes by the holders; and the disadvantage, in the first place, that he could see would be in increased leakage. He

believed the time was not very far distant when they would require to supply gas at what pressure they could give; and, in view of this, he thought that every gas manager should see that all new pipes were laid with this in view. He believed that, for ensuring a good and efficient light, 15-10ths was quite sufficient pressure. In his experience, he found this pressure would give quite a good light with an incandescent burner.

Mr. J. W. LILL (Edinburgh) was of opinion that the introduction of a high-pressure system required serious consideration. In sending gas out to districts, he thought the best way would be to draw it by means of a blower, and then restore it to the usual pressure. To his mind, the best pressure for incandescent burners stood between 9 and 11 inches—for factory purposes. There were many things for which low pressure was far better suited than high pressure, such as the supply of stoves. It would be a waste of gas to give high pressure for these things, because the chances were that people would turn the cock full on, whether it was required or not. In a town it would cost a great deal to take up all the mains and put in high-pressure ones; and, moreover, the leakage in the latter mains would be very great. In fact, in high-pressure supplies it was puzzling to find where leaks existed.

Mr. J. R. MOYES (Edinburgh) remarked that, in the event of supplying gas to towns and districts at high pressure, it would be absolutely necessary to govern the gas down to the ordinary pressure when they supplied small consumers, because, to put high-pressure gas into houses where they were using stoves or grills would cause great waste of gas. The gas bills would go up to such an extent that they would lose a large number of their private consumers. High-pressure gas would do very well for factories, where there was a large consumption for lighting; but in his opinion the condition of the mains was against its adoption, because of the large amount of leakage, which gas managers were all trying to bring down.

Mr. R. B. WADDELL (Dunfermline) did not think high-pressure gas would be useful for private houses, with ordinary incandescent burners. It was only in such cases as factories that they would require high-pressure lighting.

Mr. W. GEDDES (Edinburgh) pointed out that the subject referred to by Mr. Moyes had been fully discussed at the meeting of the Institution of Gas Engineers, on a paper by Mr. Searle, of New York, who was a strong advocate for supplying large cities by means of high-pressure mains, and regulating the consumption by a governor outside the houses of small consumers. He (Mr. Geddes) could quite understand that in a busy industrial centre high pressure would be advisable.

Mr. J. DICKSON considered that drawing the gas was quite a feasible idea. The difficulty they would have in keeping the joints tight had been mentioned. They had just listened to Mr. Wight, who spoke of pressures of 10 lbs. and 20 lbs. per square inch; and yet some of them were apparently frightened to put gas through mains at 6 inches pressure. He thought that high pressure would go for efficiency, because they would all have to overhaul their mains. If leakage increased, consumption would also increase. If once high-pressure were in vogue—and he was sure it would be—they would be able to reduce the candle power of their gas 50 per cent., and would be supplying gas at 1s. 6d. per 1000 cubic feet.

Mr. F. TERRACE (Edinburgh) expressed the opinion that the introduction of air into an incandescent burner, at the proper point, would increase its efficiency. What percentage they would apply to a high-pressure burner might be matter of controversy. Possibly in a high-pressure system there might be little or no necessity for an air adjustment, as there was now. He thought that as the pressure increased, there was no need for the air to be increased proportionally.

Mr. LILL mentioned that he had knowledge of some experiments which had been made, in which it was found that there was a light of 30 candles at 2 inches pressure, and of 65 candles at 11·3-10ths pressure. Even with all the trouble of keeping the blowers going, he considered it would be better, in warehouses and places where they required good light for business purposes, that they should put inside the shop some sort of blower for raising the pressure; and they would find that the consumption was less, according to the light. Where three lights were now required, one would do with high pressure.

The PRESIDENT said the advantages of a general high-pressure system might be stated thus: The consumer would get laid on to his premises a supply of gas suited to a variety of requirements, such as cookers, gas-engines, and high-pressure lighting. A general high-pressure system would also obviate the necessity and expense of a multiplicity of separate private installations. On the other hand, a general high-pressure system would appear to him to have serious objections. The loss by leakage would be increased, and the gas would also be affected, both in quality and quantity, by the deposition of valuable hydrocarbons. Any change to a high-pressure system should be a cautious and gradual one.

The meeting then took up consideration of the questions of the best way to increase the attendance at the quarterly meetings of the Association, and of the suitability of the hour of meeting. A general discussion followed, in which the suggestions were made that meetings should be fixed so as to avoid district holidays; that lectures by gentlemen eminent in the gas industry should occasionally be given; that the "Question-Box" might be more utilized; and that the hour of meeting should be made later than four o'clock. It was ultimately agreed to begin at six o'clock.

SMOKE PROBLEM IN LARGE TOWNS.

Some Suggested Remedies.

THE Royal Sanitary Institute had a large audience at the Parkes Museum last Thursday, when there was a full discussion of the "Smoke Problem in Large Towns"—preceded by two short notes introducing the subject by Dr. Louis C. Parkes and Dr. H. A. Des Vœux. The chair was taken by Sir William B. Richmond, K.C.B., R.A., who, in opening the proceedings, remarked that they had to fight a demon which was supported by authority—partly through ignorance and partly owing to the British characteristic of leaving things alone.

The first to read his note was Dr. Parkes, who is the Medical Officer of Health for Chelsea; and he dealt with the provisions for the prevention of smoke in the Metropolis, which are contained in the Public Health (London) Act, 1891. He said no action could be taken in respect of the chimney of a private dwelling-house; but there was really no reason in law, equity, or common sense why the private individual who lived in a dwelling-house should be allowed to perpetrate that for which a trader or manufacturer was penalized. There were many large houses in the West-end the kitchen chimneys of which at certain hours of the day, or the furnaces for the hot-water or heating apparatus, sent out dense volumes of black smoke; and there was also the nuisance created by unswept chimneys catching fire. Under these circumstances he argued that in any amendment or recasting of the smoke provisions of the Act, the chimney of the private dwelling-house should no longer be exempted. The next point was as to whether the word "black," which qualified the nature of the smoke, ought to be retained; and he held that it should not, as yellow or brown smoke might be just as much a nuisance. It was not a question of colour, but of volume, density, and contained carbon and hydrocarbon particles; and proof of the smoke emission being a nuisance should be sufficient. A recent case (Chelsea Borough Council *v.* Underground Electric Railways of London Company) failed because the Magistrate held that there had been no proof that the smoke was "black;" and the preparation of evidence in future cases under the existing law would therefore have to be entrusted to experts who had made a special study of the subject. With companies working under statutory powers, it had been held in the Divisional Court that it was sufficient answer to a complaint if the company could show they were carrying on the duties entrusted to them by Parliament "in the best possible practicable manner." But he thought it was very doubtful if Parliament contemplated, in the granting of statutory powers to the companies, that such undertakings should be expressly excluded from the operation of General Acts dealing with public health. He thought an amendment of the law was required in the three directions indicated—the abolition of the words exempting private dwellings, the removal of the word "black" as defining the nature of the smoke, and the doing away with the special privilege claimed by statutory companies. This, by bringing especially before the private individual or householder the fear of the law, would, he claimed, tend to hasten the existing movement in favour of gas for heating and cooking, of smokeless coal (whether natural or artificial) for use in fireplaces or furnaces, and of steam, hot water, and electrical plants for the same purposes.

Dr. Des Vœux, of the Coal Smoke Abatement Society, followed, and drew attention to the work performed by that organization. He pointed out that, though the Electric Lighting Clauses Act, 1899, provided that nothing in the Special Order should exonerate the undertakers from proceedings for nuisance, the South Metropolitan Electric Power Supply Bill as passed last year contained a section to the effect that the Company should not be subject to this clause. This ruse, he was informed, was being repeated in Bills for the ensuing session. As to the smoke from private houses, the Society had done a vast work in carefully studying the question; and he regretted to have to report that, in spite of the numerous tests carried out by them in conjunction with the Office of Works, they had been unable to discover any grate which consumed all the smoke from a fire of bituminous coal. There should be some public authority to decide which grate should be employed, and which not. The only hope for the cities of England was a smokeless fuel, either alone or combined with a hot water, hot air, or steam system. "Fortunately," he said, "there are several to choose from—gas, electricity, anthracite coal, coalite, and one or more copies of the latter. I suppose there is no one in this room who has not heard of coalite; for whatever else can be said of the father and mother of coalite, no one can gainsay their power of pushing and advertising their firstborn. Is he a prodigy, as they say, or a monster bubble? The next two years will tell. All will try it, and all will form their own judgment. The Coal Smoke Abatement Society have officially tested and reported on it; and I hope that before long this report will be printed and published. For myself, I am favourably impressed with it. I burnt it last year in my own house; and this I can say—it is easily lighted, burns up rapidly and brightly, and when at its best gives a more delightful fire than the best household coal. It is very hot, and has no harmful effect on the atmosphere of the room. The great drawback to it is that, being only about half the weight of coal bulk for bulk, a greater number of scuttles of it have

to be carried to the fire, causing an extra amount of leg labour. If sold at or below the price of good coal, it will be cheaper to burn, as it is more efficient, and less by weight is therefore used. I have not tried it in a kitchen range; but the reports which I have received from friends are not so favourable as might have been hoped." Speaking of the advantages of gas, Dr. Des Vœux remarked that it had all the points of a good open fire, without its dirt and without the labour connected with it. The reputed drawbacks of gas were that it was dangerous to use and had the power of drying the atmosphere. In the ten years 1895-1904, there had been an increase of 700,000 gas fires and cookers in London and the suburbs, which he thought was a sufficient commentary on the point of danger; while from long practical experience, he could say that the so-called drying effect was only produced when enough fresh air was not admitted into the room. Gas-fires had less ventilating power than coal-fires (which often had so much that doors and windows had to be kept tightly shut to prevent draught); but electrical fires had none, and if they were used some artificial means of ventilation must be found. He had always maintained that in private houses it was the kitchen chimney which emitted the most smoke; and, furthermore, that this was fortunate, as there existed in that case less opposition to a change. Gas-cooking was employed most extensively; and, as far as he could learn, cooks were now converted. The objection to gas cooking was the difficulty in connection with supplying hot water continuously throughout the house. This, however, could easily be overcome by a coke-boiler, which, at a very small annual cost, would give sufficient hot water, not only for baths and ordinary use, but for heating a radiator in the passage. What was now required was a permanent exhibition of smoke abatement appliances; and he was in hopes that ere long this might be in existence.

The discussion was opened by Dr. Seaton, who said it seemed to him that the time had come to raise the question as to how far individual occupiers and owners were entitled to perpetuate the nuisance from coal-fires. He was in the happy position of having converted his coal-fires into gas-fires, and found it altogether to his advantage; but he could quite see that a point needing settlement would be as to whether it was the owners or the occupiers who should bear the expense of this conversion.

It was pointed out by Mr. W. D. Scott-Moncrieff that it was now more than twenty-five years since he read a paper before the Society of Arts,* and exhibited a material from which the gas had been partially withdrawn; and this was a material which, for practical purposes, was the same as had since been introduced as coalite. He laid down the proposition then that even with the blast-furnace the hot blast was unable to carry out complete combustion at one operation, and that it was quite impossible in the case of a grate of any sort that was in charge of a housemaid. Twenty-five years had since passed; and they would notice that this conclusion was accepted now in so many words. It had been accepted apparently deliberately on behalf of the Coal Smoke Abatement Society. Numerous tests had been carried out; but they had been unable to discover any grate which consumed all its smoke from bituminous coal. It would be very dangerous on the part of the Society, in dealing with this question of purer air, to press unduly upon the public, as had already been done in the case of other matters connected with sanitation; and he believed that the Society could be trusted not to carry out any undue pressure either in the way of prosecution or otherwise. Already the public of this country had been subjected to the position of the man between the hammer and the anvil—not because there had not been a reasonable desire on the part of the community to comply with certain statutes, but because there had been a gap between the law of the country and the scientific knowledge which would enable the community to comply with it. There was nothing they had heard that evening to justify the opinion that, if the law was amended as proposed, there would be at disposal a state of knowledge that would warrant anything like severe pressure in connection with the domestic use of coal in London. The words he used in describing his fuel were almost identical with those in the Coalite Company's prospectus. How the gentlemen connected with it could have been in such complete ignorance of a paper that excited so much interest at the time, was not for him to say, and perhaps not for them to explain. But he would say that a community that had all the appliances in their possession to deal with a large quantity of coal as they thought fit—as in the case of Manchester—and who, in the face of the pressure that had been brought to bear and the arguments that had been used, did not, in the light of the knowledge that had come to the front lately, set to work to see what was the real practical value of this material which was now so much spoken of, and of which Dr. Rideal and other experts had given their opinions in the prospectus, they would be greatly to blame. He thought the Society might very well bring the matter to the notice of those communities who were in possession of their gas-works and the necessary appliances, so that they might set to work to see if, in its practical form, this fuel was all that it was said to be, and would be a source, not only of purity to the atmosphere, but of saving to the pockets of the people.

The next speaker was Dr. S. Rideal, who remarked that the question seemed to be whether it was possible to alter legislation on the lines of omitting the word "black." Town dwellers suffered from the blocking up of their lungs with a black pigment, when they had not been over chimney-stacks or in black smoke, but merely in the ordinary atmosphere of a town. They had not, as far as the Act would say, been in contact with black smoke, but for all that the black particles were in their lungs; and therefore it followed that these black particles could come from chimneys which presumably had not been black to the inspector who had to report these nuisances. In other words, all chimneys which gave off smoke from bituminous coal were distributing these black particles, whether one saw them or not. Wherever there was incomplete combustion of bituminous coal, these black particles were given off in immense quantities into the air, and finally found their way into people's lungs. But whether or not the word "black" was altered in the Act, it seemed to him that the invisible things in the smoke were even more injurious. The sulphur acids, which could not be seen, were after all the most harmful things both to vegetation and to health; and it had been suggested that vegetation was the best test as to whether a chimney was infringing the Act. It was most sensitive, not only to the black particles, but to the volatile oils and the sulphur acids; and there was also the sensitiveness of buildings to these acids. So that the injury to everything—to people, plants, and buildings—was not due entirely to the blackness of the smoke, but also to these invisible acids. As to the remedies, they had to realize that if injury arose from the sulphur acids—and he believed that they were the principal offenders—they were the things to be removed; and this was done by the treatment of bituminous coal in one of two ways, both of which had been referred to by Dr. Des Vœux—coke and coalite on the one hand, and gaseous fuel on the other. Now, the gas industry was a very old one; and it had been generally penalized by Act of Parliament to remove the sulphur from the gas to within about 20 grains per 100 cubic feet. Only within the last few years had many gas manufacturers secured relief from this restriction. Now coal might contain from 2 to 3 per cent. of sulphur; and when it was burnt in an ordinary grate, most of this went up the chimney, and was the invisible thing which caused the injury. If, however, the coal was converted into gas, there resulted about two-thirds of a ton of coke, which contained about half the sulphur, and (say) 10,000 cubic feet of gas, which contained not the remainder, for a good deal of the balance was removed in course of manufacture. The crude gas contained some 400 grains of sulphur per 100 cubic feet; and under the existing legislation, by which the gas manufacturers had not to remove the whole of the sulphur, but only the sulphuretted hydrogen, these 400 grains were reduced to (say) 40 grains. So they got 40 grains of sulphur per 100 feet of gas, which, for the 10,000 feet, gave a figure that was not very serious—4000 grains present in the gas from a ton of coal, as against 350,000 grains which was the total quantity of sulphur that was in the coal. Though a good many people opposed the legislation for the abolition of the sulphur clauses, he supported it, because he considered that they were a hardship upon the gas companies. They necessitated operations which caused a lot of local nuisance, and increased the cost of gas to the consumer. The Companies were successful, and so had only to remove the sulphuretted hydrogen. But now in the gas from a ton of coal in London there were only 4000 grains of sulphur; whereas if this amount of coal was burnt in a ordinary grate, 350,000 grains were given off into the air, because in the domestic grate there were no means of sulphur recovery. Therefore any increase in the use of gaseous fuel under the present *régime* was to be encouraged, because it reduced enormously the quantity of sulphur acids in the air. Coke and coalite—which were bituminous coal that had been treated before use—also contained less sulphur than coal; and therefore it was a boon to the community to use coalite and coke and gaseous fuel, which were remedies for the sulphur impurities in the atmosphere of the big towns. Their use should be encouraged before that of electricity, because some of the cases that had been referred to showed that electric installations were turning out from ordinary coal the sulphur products and black particles in just as large quantities as if the coal had been burnt in an ordinary grate. Until electricity undertakings prevented all these impurities getting into the air from their coal, the adoption of their commodity afforded no remedy for the state of things at present existing.

Mr. Lovibond said "black" was an indefinite term, and meant just what the individual chose to apply to it. Scientifically there was no such thing as black; and prosecutions based on "black" smoke would fail, because experts would say there was some tinge of colour in it. In any new Act the definition of black must be a scientific one. Inspector Dean, speaking from the practical view of the enforcement of the law, said that the reason the matter had not been tackled better before was that there was no power to do it. The inspectors had done what they could.

Dr. J. S. Owens, referring to the testing of smoke, said that some time ago he had made experiments in the matter. The percentage of carbon which passed away in smoke was obtained by various methods; and with different observers, the results were declared to vary from anything up to 180 per cent. of the weight of the fuel. Of course, this figure was absurd; but it showed what discrepancies would occur. Bituminous coal, from which smoke arose, usually contained (say) 33 per cent. of volatile matter, and of this about 16·33 per cent. only was volatile carbon. It was from the volatile carbon that the smoke entirely came, and

*See "JOURNAL," Vol. XXXVII., p. 183.

not from the solid carbon; and therefore there could not be a larger percentage than (say) 16·33 in this particular coal. The reason for the discrepancies he had referred to was that there was no definite method for obtaining the figure. The plan adopted had been to filter only a small quantity of the flue gases through slag wool, &c., and measure the amount of soot which was caught in the filter. If they investigated the matter, it would be found that the velocity of the gases at the edge of the flue was much less than in the centre; and the result was that the smoke particles, which were of a higher specific gravity than the air, and which were propelled up by the flue gases, tried to descend by the way of least resistance. The result of this was that there was a tendency for them to collect round the edges; and so the difficulty arose as to what part of the section the sample should be taken from. In dealing with gases like this, it was almost impossible to get a fair sample; and up to the present there was no satisfactory method of measuring the quantity of soot in smoke which was coming out of a chimney.

In the course of a short speech, Dr. R. Dudfield, the Medical Officer of Health for Paddington, remarked that the real point in regard to the smoke nuisance was not quality so much as quantity. He looked forward to the time when Parliament would give them power to deal with smoke irrespective of colour. But until this came about, they wanted a standard. Much emphasis had been laid on the advantages of gaseous fuel for heating and cooking; but a word of caution was necessary. The use of gas got rid of the smoke nuisance; but it brought in its train another. In his district there were a large number of middle-class flats of recent construction; and in most of them gas cooking had been introduced, while it was also gradually coming into operation in the tenements of the working classes. The consequence was that all through the summer there were bitter complaints of offensive smells from house refuse, which used to be disposed of in the coal-range. So far as his statistics went, this was even more important than the smoke nuisance from the health point of view.

Mr. F. W. Goodenough, the Chief Inspector of the Gaslight and Coke Company, said he had been asked to give the meeting a few figures, as representing, he supposed, the largest producers of smokeless fuel (in the form of gas, coke, and "carbo") in the world. As to the previous speaker's remarks, the destruction of refuse could be best dealt with by the use of the coke-boilers to which Dr. Des Vœux had referred for providing a hot-water supply. These would form a cremator for the refuse as well as a heater for the kitchen in the winter, and a provider of hot water all the year round. The number of gas-cooking stoves in use in his Company's district had in the last three years grown from 233,000 to 314,000, which was an increase of 81,000, or roughly speaking 35 per cent. Of these, 200,000 were in the homes of the working classes in combination with slot-meters; and undoubtedly the enormous increase in the use of gas-cookers had had great influence on the atmosphere of London. Especially in the summer months, it was a matter of common observation that it was possible to walk down the whole length of a road in a suburban district at the time breakfast was being cooked, and not see smoke issuing from a single chimney. This showed the almost universal use of gas for cooking; and if only the public would adopt Dr. Des Vœux's solution of the coke-boiler in conjunction with the gas-cooker, there would be no need to burn coal at any time of the year. His Company were not a philanthropic institution. What they were doing for smoke abatement was from a business point of view; but it was the fact that they were doing much for smoke abatement in using every endeavour to push the use of gas for cooking and heating. Quite a large staff of women demonstrators were employed in connection with the former branch to go round and give instruction to the cooks, or where desired to the mistresses, as to the economical use of gas for cooking. In regard to gas-fires, the number had grown in three years from 90,000 to 117,000—he referred to those supplied by the Company, and not to the many others purchased elsewhere by the public. This was an increase of 30 per cent. in three years. The Royal Sanitary Institute and the Coal Smoke Abatement Society would do very good work if they could induce architects to realize that there was such a thing as gaseous fuel. As far as he had been able to find out, no architect—or practically none—ever bore this in mind when designing a building—the old coal-range was put into the kitchen as a matter of course. In America, a gas cooking-range was supplied in every flat by the landlord, and included in the rent. If only architects would wake up to the fact that their beautiful buildings would be much less damaged if there was no coal burned in open grates and in kitchen ranges, and that gas-cooking and heating had come to stay, it would be a distinct advantage from the smoke abatement point of view. Gas used with a blast was also displacing coal for industrial purposes. All the big newspapers practically were adopting gas instead of coal for the melting of their type; and in several instances this course had been adopted owing to threat of prosecution for smoke nuisance. Gas was being very largely used as fuel at Woolwich Arsenal; and this would probably be encouraging to the Society, as being direct support from the highest authority. It had been found that the work could be done much more rapidly and certainly by this means. The same thing was also to be seen in Birmingham.

The meeting concluded with hearty votes of thanks to the authors of the papers, on the proposition of the Chairman.

THE MANAGEMENT OF PLANT.

The President of the Association of Engineers-in-Charge for the coming year is Mr. W. H. Patchell, M.Inst.C.E.; and a large number of members put in an appearance at St. Bride's Institute last Wednesday evening to hear him deliver his Inaugural Address. Of course, steam, gas, oil, electricity, and water are all represented by different members of the Association; and as the majority of them are engaged rather in the supervision and operation of existing installations than in the erection of new ones, the President very usefully devoted his remarks to some "Economic Considerations on the Management of Plant." This proved to be a subject of sufficiently wide scope to produce, at the able hands of Mr. Patchell, an address which was of the very greatest interest to his hearers. In the course of a few general remarks, he said a common fault was close attention to one particular point while the rest of the concern ran wild, and for the time being unheeded. A skilful leader knew all that was going on; and the men who had come to the top were neither those who had found it necessary to do every job themselves (who were unable to impart knowledge to others), nor those who sat in their office writing memoranda to their staff. In support of this contention, he quoted the following statement by an American Government official: "To attain to the highest success as an engineer, you must not be the type of man who knows how to do things but cannot tell others how to do them—the man who gets knowledge abundantly but can apply it only through his own fingers. Instead of directing your energy simply to increasing your own output by 50 per cent., or even 100 per cent., it is far better—you make yourself more useful to the world—to use your energy to increase the output of a hundred men by 10 per cent. The world recognizes this by awarding the prizes to the administrators."

The President had a good deal to say on the subject of water supply—remarking that this was often drawn from the mains when it might be more profitably taken from a well on the premises, owing to the low price and simplicity of the tube well, which now enjoyed a popularity that some years ago would have appeared impossible, or at any rate quite improbable. In this connection, he pointed out that, when the water supply was plentiful, the air-lift system could claim a record for capacity, and coupled reliability with the advantage of having all the working parts on the surface, and an economy at any rate well within the range of commercial requirements. As showing, however, the uncertainty in respect to the supply of water to be obtained from tube wells, he cited a case of two 13-inch wells situated within 100 yards of each other. One of these boreholes yielded 4000 gallons for an hour or so, when the quantity gradually fell to 2000 gallons, at which it remained constant; while the other yielded 27,000 gallons continuously. An instance was given of a gas-producer plant and engine driving a compound equipment consisting of an air-lift pump, which raised the water 120 feet to the surface, and of a plunger pump which sent the water to a reservoir at a head of 180 feet; the cost of fuel used, when raising 11½ million gallons, being 0·55d. per 1000 gallons. On the same site, a three-throw deep-well pump, driven by an engine using town gas, pumped 17 million gallons, at a cost for fuel of 1·26d. per 1000 gallons—the price of the gas being 3s. 3d. per 1000 cubic feet. The treatment of water for boilers was touched upon; and on this head Mr. Patchell said he believed one of the strongest arguments in favour of the present London water supply was the low death-rate, which was quoted to show its special suitability to requirements. They had, however, only to return home from a visit to districts more favourably situated, to realize how hard their lives were, and to wish that more consideration was paid to those who used soap or evaporated the water, and less to those who died.

The next subject—fuel—was one on which the President naturally found a good deal to say; for, as he remarked, the great rise in the price of coal has necessitated the consideration of the more economical use of it, and of the possibility of employing cheaper qualities. To assist draught in connection with boiler-furnaces, the use, wherever practicable, of a fan was advocated as being much more economical than a steam-jet; and the need for more attention being given to the regulation of the draught by the dampers was emphasized. Another point on which he laid stress was the need for carefully recording the percentage of carbonic acid in flue gases; the custom in many German works being cited of paying the stokers a premium on the amount of carbonic acid recorded, which had beneficial results. The purchase of fuel by analysis, said Mr. Patchell, was very important; but when they considered the ease with which coal merchants could sell their stock, it was not surprising that they did not generally view the system with favour, and resented the incorporation of such clauses in their contracts. More united efforts would be needed to get them educated up to this equitable method of buying fuel. Experience gained by several years' trial had proved to him that sampling and analysis might be done quite commercially under a contract which stated the amount of volatile hydrocarbons and ash allowable, with a penalty if the amount of ash was exceeded. Other matters touched upon were mechanical stokers, steam superheating, pipe-covering, water heating by economizers, and causes of waste in the engine-room. Every effort, he remarked, should be made to prevent the emission of smoke, the underlying principle of which was the admission of the proper quantity of air at the

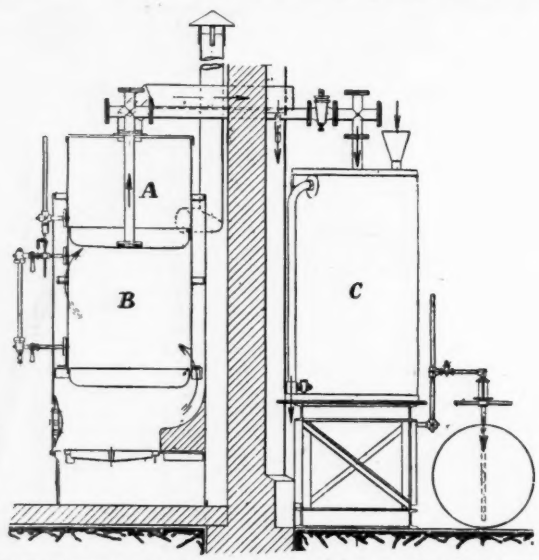
proper time, and the removal of cooling surfaces as far as possible from the gases until combustion was complete, as if the temperature was lowered below the critical point before combustion was effected no amount of care in air regulation would prevent smoke. He left this branch of his subject with the statement that good lighting was conducive to economy in both the engine and boiler rooms, as plant in a badly-lit room never got properly looked after or cleaned.

The final section of the address dealt at some length with tests; the President remarking that it was an unfortunate fact that in many cases an engineer-in-charge did not really know what his plant was doing—and all for the want of tests which he could carry out himself with very slight expense or inconvenience. At its conclusion, a very hearty vote of thanks was accorded to Mr. Patchell, on the proposition of Sir Alexander B. W. Kennedy, seconded by Mr. W. H. Maw; both of whom referred—as did also the President—to the great amount of research carried out by the late Mr. Bryan Donkin in connection with boiler tests.

MANUFACTURE OF CONCENTRATED GAS LIQUOR.

A paper was read by Herr B. Thiel, of Bremen, before the last meeting of the Rhenish and Westphalian Gas Association, upon the manufacture of concentrated gas liquor in small gas-works. From the text of the communication published in the "Journal für Gasbeleuchtung," we derive the following particulars.

Numerous small gas-works exist carbonizing so little coal per annum that they cannot profitably work up their own liquor into a saleable form, or are situated so far from a manufacturing town that the crude liquor cannot be sent remuneratively as such to an ammonia recovery works. Herr Thiel's idea is to provide such small undertakings with a cheap and simple apparatus, requiring very little labour and no skilled attention, in which liquor can be concentrated to such an extent that it can be sold at a profit instead of being thrown away and perhaps becoming a nuisance. The plant consists of an upright cylindrical vessel



Thiel's Apparatus for the Manufacture of Concentrated Gas Liquor.

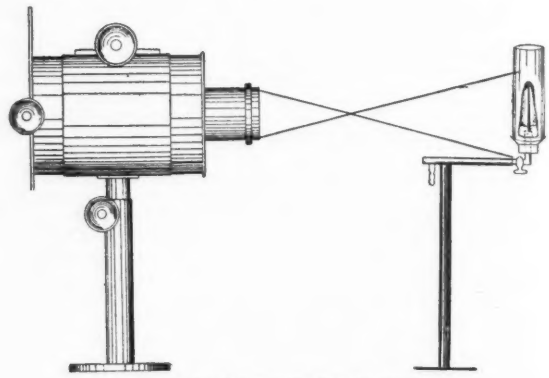
2 ft. 8 in. in diameter, divided into two portions, A and B, by means of a horizontal partition. The upper and smaller portion A is uncovered except for a loose wooden lid to exclude dirt. The partition converts the lower receptacle B into a closed still, the pipe for the escape of vapours passing vertically up through the centre of A. All round B is a sheet-iron casing, 3 ft. 4 in. diameter, which extends about half way up A, and is fitted beneath the base of the still B with a grate for the combustion of solid fuel—*e.g.*, waste coke. A chimney is fixed at the top of the casing to ensure the necessary draught. Each section of the cylinder is provided with its own gauge-glass and safety valve. The outlet from the still carries a cock, and is then bent downwards to join the coil of a condenser C; the condensate being finally received in any convenient barrel or tank. The plant is erected in an odd corner of the retort-house, so as to be under the eye of the stoker, with the condenser alongside or else in the open air as may be more convenient; and the whole of it occupies only about 16 square feet of ground-surface.

When working the apparatus, about 90 gallons of crude liquor from the pit are pumped by hand into B and heated (without the addition of any lime) for two or three hours, until the whole of the free ammonia has distilled off. Accompanied by a certain quantity of water, it condenses, collects in the receiver, and is ready for sale as impure 10 per cent. aqueous ammonia. The cock on the pipe leading from the still is then shut, when the pressure forces the remaining liquor from B, through an appropriate pipe, into A. While in this open pan, the liquid is exposed to the heat rising from the top of B and the upper part of the furnace casing; so that its strength (in terms of combined ammonia) gradually increases. Periodically, a further quantity of crude liquor is pumped into the still, and the free ammonia is expelled as before. When A is full, some of the liquid is run off into any handy receptacle, and allowed to cool thoroughly. It is then pumped into the elevated receiver for liquor, whence it flows to the ammonia washer for the gas, where it is used instead of fresh water. In this manner a solution containing combined (but no free) ammonia is constantly employed for washing the gas; the free ammonia it takes up during the process being periodically extracted in the manner outlined. Eventually, the liquid becomes so concentrated as to contain sufficient non-volatile ammonia to bear the cost of carriage to a recovery works.

Herr Thiel claims on behalf of his system that practically the whole of the ammonia obtained from the coal is recovered, partly in the form of strong liquid ammonia and partly in that of a strong solution of ammonium salts. No lime is required. No troublesome waste liquor is left, as the bye-product is merely steam. No clean water is required to wash the gas. The plant is only in operation intermittently; therefore a special attendant is not needed. The use of the plant also effects an economy in the size and cost of the tanks holding the gas liquor.

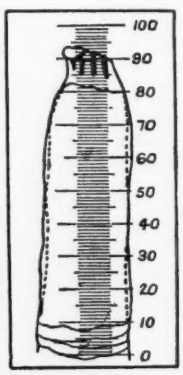
TESTING THE DEFORMATION OF MANTLES.

A recent issue of the "Journal für Gasbeleuchtung" contains a note by Dr. Bärenfänger, Chemist to the Kiel Municipal Gas-Works, describing an apparatus designed by Dr. Krüss for observing and recording progressive deformations of incandescent mantles.



Apparatus for Testing Mantle Deformation.

As shown by the accompanying figures, the apparatus consists of a camera provided with rising and focussing adjustments, and with a graduated ground glass which can be racked upwards or downwards by the milled head on the left. The camera is fastened rigidly on a base at a certain fixed distance—say, 8 inches—from the stand carrying the mantle under observation. Four marks are made on the burner at horizontal angles of 90 degrees apart. Each of these marks is successively turned towards the lens of the camera, the image of the mantle is focussed accurately, a piece of oiled paper is laid on the screen, and the outline of the mantle is carefully drawn upon it. After having been alight for the desired length of time, the whole operation is repeated, each new drawing of the mantle being made in dotted lines upon the corresponding original. If the mantle is tested, new and old, on the photometer in the same four positions, values are obtained for the illuminating power lost by the deformation indicated on each double drawing. The graduations on the screen enable records to be kept of the parts of the mantle which are not brought to full incandescence.



In the notice of the death of Mr. John King, the Manager of the Bo'ness Gas-Works, which appeared in the "JOURNAL" last week, it should have been stated that Mr. David D. Stiven, who was appointed Interim Manager, pending Mr. King's illness, still holds the position; no successor to the deceased having yet been selected.

Some of our readers may be aware that Mr. H. M. Thornton, Managing-Director of the Richmond Gas Stove and Meter Company, Limited, was elected last year as one of the representatives of the ward of Castle Baynard in the Court of Common Council of the City of London. It is now announced that he has retired from the Council.

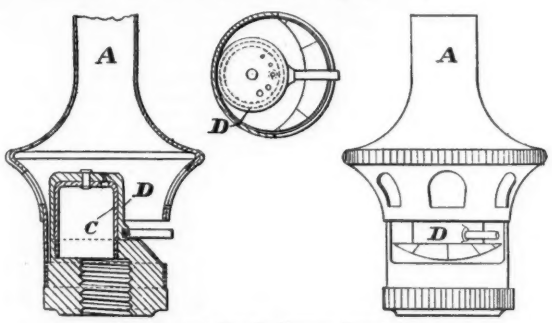
REGISTER OF PATENTS.

Gas Regulating Devices for Bunsen Burners.

HARRISON, C. W., of Middlesex Street, E.C., and NOAD, A. C., of Fulham, S.W.

No. 23,529; Oct. 23, 1906.

This invention relates to gas-regulating devices of the kind in which the gas passes through one or more orifices forming part of the gas-nozzle. Such regulation has in some cases been attempted by forming the nozzle with several orifices through which the gas issues simultaneously, and by providing means for closing some of the orifices. Better results have, however, the patentees believe, been obtained by the use of a nozzle having a single centrally situated gas-orifice, whose area is regulated by contracting or expanding it, or by partially obstructing the flow of gas through the orifice by means of a needle valve. An objection to the latter arrangement, they point out, is that, since the orifice does not present a plain unobstructed hole for the flow of the gas, considerable friction is produced, and the stream of gas as it issues, instead of continuing as a jet, becomes too quickly diffused. For this reason the practice of employing removable nozzles having orifices of varying dimensions, and of removing one nozzle and replacing it by another having an orifice of different size, is often resorted to. The chief object of their invention is to enable the advantages mentioned with respect to the interchangeable nozzles to be obtained without the necessity of interchanging them.



Harrison and Noad's Burner Regulator.

In the arrangement shown, the central gas-orifice is formed in an inverted metal cup C, secured in the body of the nozzle in an eccentric position—being central with regard to the burner-tube A, and, consequently, eccentric with regard to the axis of the cup itself. Closely fitting upon the inverted cup is a cup or hood D, formed with apertures of varying size, concentrically arranged with regard to the axis of the cup or hood. Any one of the apertures is adapted by the angular movement or rotation of the hood to be brought into coincidence with the orifice in the inverted cup C, and the quantity of gas supplied to the burner thereby regulated. The size of the orifice is about equal to that of the largest of the apertures in D. To enable the hood to be readily manipulated from the exterior by the fingers, it is provided with a finger-piece, arranged to travel over a dial or scale engraved to indicate which aperture is in coincidence with the central orifice for any particular position of the hood.

Automatically Igniting Gas-Burners.

LYON, H., of Oneonta, U.S.A.

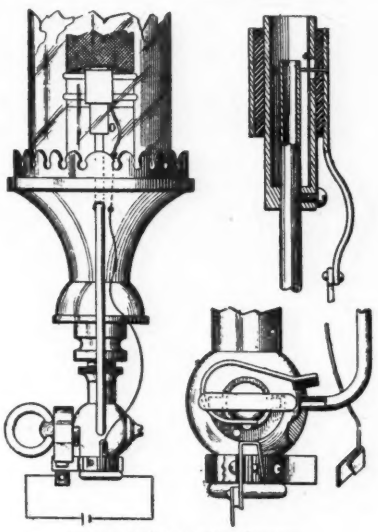
No. 24,359; Oct. 31, 1906.

This invention comprises a main burner to which the supply of gas is controlled by a tap formed with a bye-pass opening from which a tube extends to a point near the main burner. An insulating collar, around which is a band of conducting material, is attached to the body portion of the tap, and terminates in outwardly projecting ears clamped together. A contact plate, to which a leading-in wire is attached, is held between, and is suitably insulated from, the projecting ears; the body of the plate projecting upwards to a point above the ears where a horizontal extension is formed. Beyond this extension the material of the contact-plate is bent downwards (as shown), so as to form an inclined extension adjacent to which a contact-point is placed. In this manner when the gas is turned on by rotating the tap, contact is made between the inclined extension and the contact-point, closing the metallic connection between the leading-in wire and the conducting material.

A spring, formed into a bow, is rigidly attached at one end to the plug of the tap; while at its free extremity it is preferably bent outwardly to form a shoe, to which an insulating block is attached. The inclined extension of the contact-plate is so placed that it lies in the path of the shoe when the plug is rotated, and the resiliency of the spring is sufficient to overcome that of the contact-plate. Hence, when the gas is turned on, the insulating block strikes the outer face of the inclined extension and makes a contact between this part and the contact-point, as described above.

When the tap is rotated to its extreme position, and when the contact is being made at the contact-point, the bye-pass admits gas into the pilot-tube; but on the tap being released, the resiliency of the contact-plate operates to displace the shoe and rotate the tap backwards through a small angle; and after this slight reverse motion has taken place, the bye-pass closes.

Upon the upper extremity of the pilot-tube is attached a pilot-burner, comprising a tubular body open above and having an opening in its lower extremity receiving the tube. A set-screw affords means for securing the pilot-burner in position and for adjusting it. The upper end of the burner projects above the extremity of the pilot-tube; and the inner diameter of the burner being greater than the diameter of the pilot, an ignition chamber having air-inlets is formed.



Lyon's Self-Lighting Burner.

Around the pilot-burner a metal sleeve is secured over a suitable insulating ring, and having an extension to which an insulated conductor is attached. In the upper portion of the pilot-burner a transverse igniting filament is placed—preferably passing across at about the level of the mouth of the pilot-tube. One extremity of it is attached to the inner side of the burner; while the opposite extremity passes through the insulating ring to the metal sleeve. In order to prevent its coming into contact with the pilot-burner at this point, an enlarged opening is formed through which the filament passes.

The insulated conductor on the pilot-burner has attached to it at its lower extremity a shoe, which is adapted to engage the band of conducting material upon the body of the tap, and so make contact and complete a metallic circuit from the band through the insulated conductor to the filament; while from the filament a complete metallic contact exists through the pilot-tube back to the tap.

At a suitable point on the burner, an electric wire is attached, which leads to a dry-cell—the opposite terminal of the battery being in communication with the contact-plate on the tap through the leading-in wire.

The filament employed is preferably of No. 40 gauge, and composed of an irridio-platinum containing 25 to 30 per cent. of irridion—a composition "substantially infusible." It is preferred to mount the filament out of alignment with the flame of the pilot-burner, so that the heat developed by the burner is not added to that of the filament, which is incident to the passing of the electric current. This materially adds to the life of the filament. While the filament is far enough away from the issuing gas to prevent its receiving any great heat from it, it is sufficiently near to enable its incandescence to be operative in igniting the pilot-burner.

The illustration shows a side elevation of the burner, an enlarged side elevation of the cock of the burner, and a vertical section through the upper portion of the pilot-burner constituting a feature of the invention.

Rotary Blowers.

THORP, T., of Whitefield, near Manchester.

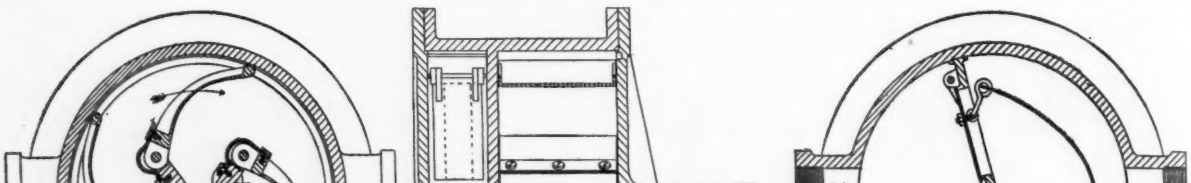
No. 29,132; Dec. 21, 1906.

These rotary blowers are made so as to act as regulators of the pressure at which the gas or air passing through them is delivered.

As shown (p. 574), a cylinder, supported on a base-plate, is closed at both ends by covers, as usual. One cover is formed with a stuffing-box placed eccentrically to the cylinder—say, towards the bottom; and a shaft passes through the stuffing-box into the cylinder, driven by pulleys or gearing, and suitably supported at its outer end.

Inside the cylinder is a drum concentric with the shaft. It is fixed on it and fits between the covers. The drum is formed with, or has fixed to it, a number of lugs, to which vanes are hinged by pins passing through the lugs and bosses at the inner ends of the vanes. The outer ends of the vanes are cross-grooved and fitted with leather strips, rounded on the face, which fit against the periphery of the cylinder. The vanes fit between the covers, and are pressed outwards against the periphery of the cylinder by springs—helical springs placed between the drum and the vanes, or torsional coiled springs placed round the pins of the hinges in tubes, and connected at one end to the bosses of the vane and at the other to the lugs on the drum. Strips of leather are fixed along one edge to the drum and along the other to the vanes, so as to cover the hinges and prevent leakage. The vanes are preferably of such length and sectional shape that, when the bosses of each vane arrive at their lowest position (next to the periphery of the cylinder), the outer side of the vane is approximately concentric therewith with a small working clearance; while the inner side of the next preceding vane is approximately concentric to the boss, and for the remainder of its length follows the outline of the preceding vane. In this way, the space enclosed by each pair of vanes in that position is reduced to a minimum, enlarges as they are turned towards the top, and then decreases again.

On the other cylinder cover a valve chamber is cast. It contains along its periphery ports leading into the cylinder; those on the side where the space between the successive vanes increases being divided from those on the other side where the space decreases by a diagonal



Thorp's Rotary Blower.

midfeather in the valve-chamber, which has an inlet pipe on the side of the former and an outlet pipe on the side of latter ports. The gas, arriving at the inlet, passes into one half of the valve-chamber, and thence through the ports on that side of the midfeather into the enlarging spaces between the vanes, through the ports on the opposite side into the other half of the valve-chamber, and to the outlet.

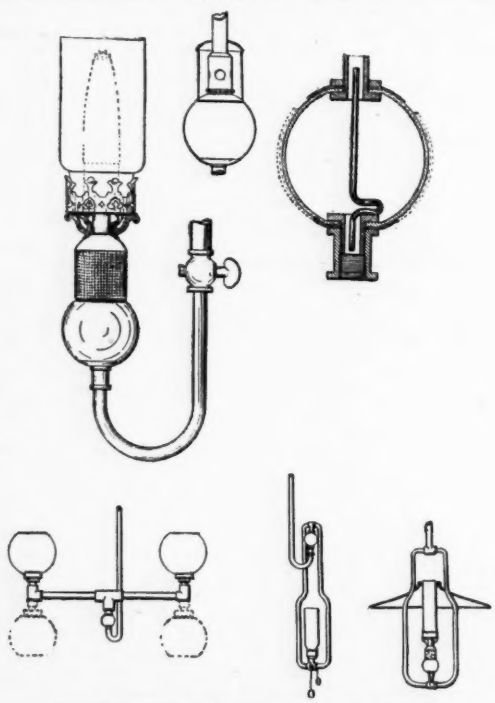
When the pressure in the supply and delivery pipes, or their ratio, is generally constant, the delivery ports are so placed that they are opened by each vane when the gas in the compartment between it and the following vane has been compressed to the pressure in the delivery chamber; while if the pressures are variable, the ports are provided with self-closing valves, which open when the air or gas has been compressed to the delivery pressure.

In the midfeather, two openings are arranged closed by flap-valves. One of these (not weighted) is placed on the outlet side of the midfeather, so that the pressure in this half of the valve-chamber keeps it closed while the blower is working. But if the blower is used for gas or air under pressure and, through some accident or otherwise, the blower is stopped and the pressure in the delivery pipes decreases, gas can flow through the valve direct from the inlet to the outlet pipe without passing through the cylinder and keep up the ordinary gas or air supply to the delivery main. The other valve is placed on the inlet side of the midfeather, and is loaded by a spring to the pressure that is to be maintained in the delivery pipe; so that if the consumption of gas or air from the delivery main is stopped or reduced, the gas or air passes back from the delivery compartment into the supply compartment, and no gas or air will be delivered till the pressure in the delivery pipe has fallen to the desired pressure—the blower thus acting also as a pressure regulator.

Fittings for Incandescent Lighting.

Cooper, J., and Young, W., of Shaw, near Oldham.
No. 23,926; Oct. 27, 1906.

This invention has special reference to the use of incandescent gas-mantles in mills and other places, where, owing to the working of



Cooper and Young's Incandescent Burner Fittings.

machinery, there is a risk of the mantles being shattered with the vibration of the building, and where, owing to fluff and other matter floating about in the air, there is a risk of the gas-jet and the air-holes in the burner stem being choked up, and the brilliancy of the light diminished.

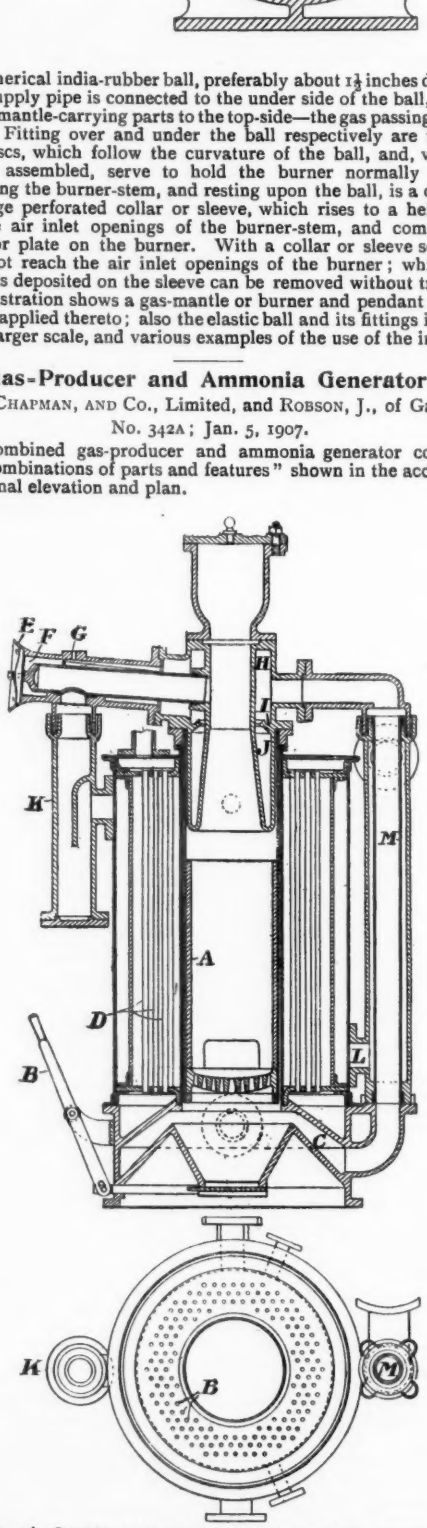
The burner or burner mantle-carrying parts are mounted (as shown) upon a spherical india-rubber ball, preferably about 1½ inches diameter. The gas-supply pipe is connected to the under side of the ball, and the burner or mantle-carrying parts to the top-side—the gas passing through the ball. Fitting over and under the ball respectively are two cup-shaped discs, which follow the curvature of the ball, and, when the parts are assembled, serve to hold the burner normally vertical. Surrounding the burner-stem, and resting upon the ball, is a comparatively large perforated collar or sleeve, which rises to a height well above the air inlet openings of the burner-stem, and comes below a flange or plate on the burner. With a collar or sleeve so placed, fluff cannot reach the air inlet openings of the burner; while whatever fluff is deposited on the sleeve can be removed without trouble.

The illustration shows a gas-mantle or burner and pendant with the invention applied thereto; also the elastic ball and its fittings in section and to a larger scale, and various examples of the use of the invention.

Gas-Producer and Ammonia Generator.

Clarke, Chapman, and Co., Limited, and Robson, J., of Gateshead.
No. 342A; Jan. 5, 1907.

This combined gas-producer and ammonia generator consists in "novel combinations of parts and features" shown in the accompanying sectional elevation and plan.



Robson's Combined Gas-Producer and Ammonia Generator.

Within the apparatus is a protective liner A (of any suitable material) resting on a fire-grate, which, in turn, rests on a ring riveted to the

shell of the producer. A coal-feeding hopper with slide, to be opened and closed by suitable lever mechanism, is above; and there is a hopper below, with a slide actuated by a lever B. C shows an annular space outside of, and open to, the lower hopper.

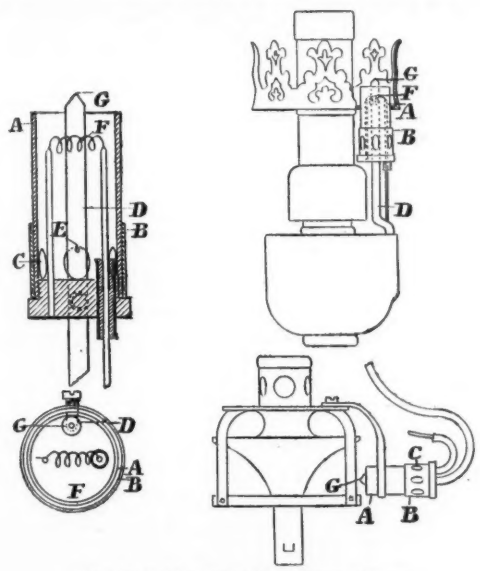
The centre chamber is that of the gas-producer; and the annular space between, containing the vertical tubes D, that of the boiler. Air is sucked in by the trumpet-shaped pipe E at the top of the producer, entering the annular space F. At the same time a small quantity of water is dropped through the pipe G and spread around the pipe by a scroll baffle. The water is vaporized by the hot gases passing through the pipe and becomes mixed with the air passing in at the pipe E, whereupon it passes around the annulus H; and should any water not be vaporized by contact with the hot pipe, it will pass into the channel I, which, on becoming full, will allow any excess to pass down the sides of the vaporizing chamber J, where, owing to the high temperatures of the gases passing from the producer, it will be vaporized and descend to the bottom of the producer, where, entering the annular space C, it will pass up through the fire-grate into the body of the hot fuel, where it is decomposed. The combustible gas now produced passes into the pipe K, which is also a dust-separator, and into the annular space shown, where it will part with some of its heat to the solution contained in the boiler. Afterwards it is drawn out by suction at the bottom of the annular space through the pipe L, passing into the annular space above, and imparting heat to the steam and air contained in the pipe M, which is passing to the fire-grate. The combustible gas now passes into the jacket which surrounds the ammonia vapour receiver employed to keep the ammonia vapour hot.

Igniting Gas-Burners.

GAUDIN, A., and TELLIER, E., of Douai, France.

No. 11,301; May 14, 1907.

This device for igniting gas-burners is of the class wherein "a platinum wire is rendered incandescent by an electric current and ignites the burner either directly or by means of an auxiliary gas-tube, and wherein a mixture of gas and air is produced in a carburettor, the mixture being ignited by the platinum wire, said wire being heated by the electric current to the degree necessary to cause the explosion of the mixture in the carburettor, the wire being heated to the further state necessary to light the gas-burner by catalytic action, so that the platinum is not given a higher calorific degree than necessary to light the gas." The igniting parts are not in contact with the flame of the gas, so that they are protected from damage. The illustration shows a sectional elevation and a plan of the device; also the device adapted on an incandescent burner, and on a burner with an inverted flame.



Gaudin and Tellier's Gas-Burner Igniter.

The cylinder A, forming the wall of the "carburettor," is fixed on a base provided with a shoulder on which an annular rotatory adjustable ring B rests. The cylinder and ring are provided with corresponding holes C, the function of the ring being to regulate the admission of the air in the carburettor by closing the holes more or less. The base is traversed by an auxiliary lighting-tube D, connected to a special cock, which allows the gas to pass during the period of ignition only. The tube ends slightly above the cylinder A, and is arranged to produce a flame jet about equal to the whole height of the carburettor. Besides this, it is provided at its lower part inside the carburettor with a hole E, giving a small jet of flame about equal to twice the interior diameter of the tube D, which flame does not reach beyond about a fifth of the distance which separates its source from the lighting device.

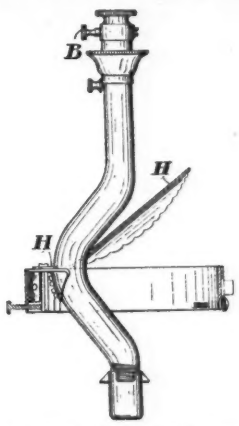
As soon as the auxiliary tube D allows gas to escape, the carburettor is filled with a mixture of air and gas—the air entering through the holes C and the gas through the hole E. The mixture, which is lighted on contact with the platinum wire F heated to a red heat by an electric current, produces a slight explosion, which will ignite the gas from the outlet G and from the small hole E, the flame from which does not extend far beyond the platinum wire. As soon as the explosion is produced, the wire is not in contact with the gas flame—the flame from the outlet G being above the platinum, and the height of the jet from the hole E being too small to have any harmful action on the platinum. "The electric current normally used must only heat the platinum to a slightly red state, which is then heated to white heat by the action of the mixture formed in the carburettor till it ignites the burner. Afterwards, the heat of the platinum sinks to the degree obtained by the electric current, so that it is never heated beyond the calorific degree necessary to light the gas."

Vertical Inverted Gas-Burner.

BRAY, J. W., of Leeds.

No. 17,575; Aug. 1, 1907.

This invention has for its object to protect the bunsen tube, gas-nipple, and gas-adjuster, to a great extent, from the heat given off from the burner, by deviating the bunsen tube from the usual vertical line, and carrying from the bent tube a globe holder and deflector, as shown.



Bray's Inverted Burner Deflector.

At about the bend is attached a bracket, to carry the gallery or globe holder, and which also serves to carry a deflector H—curved upwards in order to protect the mixing-chamber portion of the bunsen tube and to deflect the heated gases away from it. In this way, a portion of the bunsen tube is surrounded by cool air, and the gas-regulating screw B "may be handled with comfort, although the burner may have been alight some hours."

APPLICATIONS FOR LETTERS PATENT.

24,326.—HARPER, J., "Mantle support." Nov. 4.
24,329.—SLADING, J., "Regulating the supply of gas to incandescent lamps." Nov. 4.
24,397.—BECKER, H., "Gas-producers." Nov. 4.
24,405.—BLANK, F., "Inverted lamps." Nov. 4.
24,412.—STANLEY, R. J., "Rotary gas-motor." Nov. 5.
24,423.—WILSON, J. W., "Gas-ovens." Nov. 5.
24,429.—HALL-BROWN, E., "Gas-producers." Nov. 5.
24,463.—BECK, C. W., "Acetylene generators." Nov. 5.
24,577.—PAYNE, S., "Composition for use in the manufacture of fire-bricks, retorts, &c." Nov. 6.
24,620.—LAXTON, J., "Gas-cocks, ball-and-swivel joints, and sliding pendants." Nov. 6.
24,622.—BAYLEY A. L., and WALKER, W. W., "Connecting flexible tubing to pipes, taps, and the like." Nov. 6.
24,659.—IRVIN, T. W., "Carburetting air." A communication from G. D. Irvin. Nov. 7.
24,723.—CLAYTON, H. H., "Gas-lighting devices." Nov. 8.
24,739.—FLETCHER, RUSSELL, AND CO., LTD., NEIL, A., and FLETCHER, T. W., "Gas-fire dog grates." Nov. 8.
24,856.—LANDER, W., "Generating acetylene." Nov. 9.
24,878.—GUNNING, J., "Lanterns for gas-lamps." Nov. 9.
24,890.—HICKS, J. A., "Petrolized air gas." Nov. 9.

Accident at Southport Gas-Works.

Last Tuesday evening, at the Southport Gas-Works, the cover was being lifted of a purifier-box, 24 ft. by 38 ft. 6 in. by 5 ft. 6 in., containing two tiers of oxide, which was shut off the previous Saturday; and, when the cover was from 6 to 8 inches above the box, the purifying material, which was charged with about 50 per cent. of sulphur, caught fire through spontaneous combustion. There was a deposit of naphthalene on the sides and top of the cover, which the burning sulphur quickly ignited; and before the men who were lifting the cover could get out of the way, the flames rushed out and burnt five of them about their hands and faces. The burns the men received were not of a serious character; and after they had been attended to at the infirmary, four of them were sent to their homes. One man, Isaac Rimmer, was, however, detained at the infirmary, as he was suffering from shock as well as burns; but he is progressing satisfactorily. The Engineer and Manager (Mr. John Bond) and his staff succeeded in putting out most of the fire before the arrival of the fire brigade. The estimated damage was about £30.

Accident to a Water-Tank at Finchley.—During the heavy gale which was raging in the early hours of last Wednesday morning, a tank at North Finchley, standing on a water-tower about 40 feet high, belonging to the Barnet District Gas and Water Company, collapsed; and damage was done by the escaping contents to some eight cottages in the immediate neighbourhood. The Company had been gradually filling the tank during the preceding three weeks, and testing it day by day; but no water had been put in for twelve hours before the accident occurred. During the afternoon the tank had been examined by the Company's inspector, who reported everything then all right.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

British or Metric Measurements.

SIR,—Referring to the remarks in the article under this head in your issue of the 5th inst., I should like to draw attention to the phrase "under the circumstances," which you use in connection with the practice of the Danes to use metric weights and measures for metric countries and English measures for English-speaking countries. The thought that occurs to me on reading this is—although this may be a practical solution, "under the circumstances," are the circumstances themselves satisfactory? If not, why not alter them?

I think you and all your readers will agree with me in saying that no solution of the weights and measures problem will be satisfactory until we have a system of weights and measures suitable alike for science, manufacture, and trade in this and all other countries—*i.e.*, an international system, suitable for all purposes. The way to such a system is fairly clear, and would be feasible if it were not for a certain body of obstructionists who appear to be blind on this particular subject. This body, I regret to say, is the body of scientists—I will not say the "so-called" scientists, although if a scientist is one who seeks by research and in other ways to find out the truth of any particular matter, I venture to say that, as regards the weights and measures problem, present-day scientists, with some honourable exceptions, are not worthy of the name.

I am pleased to find that our efforts to extend the sources of information on this question have your hearty approval; and while in the Danish investigation there is something valuable to be learned concerning the principle on which a perfect system of weights and measures should be founded, I believe that investigations in some other European countries will be astounding, not to say humiliating, to the theorists who now swear by the metre.

GEO. MOORES, Secretary,
Nov. 12, 1907. British Weights and Measures Association.

[Some circumstances can be altered; other circumstances cannot. Denmark being adjacent to a great metric country (Germany), and also trading with Great Britain, is placed in such circumstances that, to some extent, they adopt a double system of measurements—metric and British. As far as their circumstances can at present be altered, they have done so this year by legally establishing the metric system. Our correspondent looks forward to "an international system, suitable for all purposes." That would be the ideal, like a universal language and universal peace. But the time is not yet; and meanwhile we must be practical "under the circumstances" in which we live.—Ed. J.G.L.]

Raising Low-Level Water for High-Level Service.

SIR,—In reply to "Interested" in the "JOURNAL" for Oct. 29 (p. 354), I beg to refer him to the water-motor pumping-engines at the Whitehaven Water-Works. Here the service reservoir is supplied from the reservoir on the hills through an 11-inch main several miles long. At the service reservoir, the water is used in two hydraulic engines, working together, with power cylinders 18 inches in diameter and double plunger pumps 9 inches in diameter by 30 inches stroke. The working head in the power cylinders is about 80 feet; and the pumps raise part of the same water to 307 feet head, to a small reservoir for supplying the high levels of the town. The discharge from the power cylinders passes into the service reservoir. There are air-vessels at the entrance to the engine and the discharge from the pumps. When the engines are raising about 200,000 gallons of water per 24 hours, the variation on the pressure-gauge on the inlet does not exceed 10 feet; and on the pumps, 5 feet.

I shall be greatly benefited if readers of the "JOURNAL" will supply other similar instances to the above.

Nov. 11, 1907. HYDRAULICS.

Venturi Meters and the Working of Filter-Beds.

SIR,—In reply to the letter signed "G. N.," in the "JOURNAL" for Oct. 29 (p. 354), asking for a description of a modern filtering plant with automatic regulators and recorders, I may refer to an installation I know of where provision is made for eight filter-beds, each connected to a "Venturi" tube, and the whole eight tubes being grouped in two tiers in one meter-pit.

Each Venturi tube has a double water-column differential gear. Of the four water-column pipes for each tube, two give the Venturi head; the other two, the filter-bed resistance. One of the water columns is connected to the unfiltered water in the filter-bed; the other to the filtered water before it enters the Venturi tube.

The difference between these two pressures is obtained in the same way as in the Venturi water-column recorder—*i.e.*, by means of a differential gear. The two results thus obtained—viz., the rate of flow and the filter-bed resistance—are communicated and marked on one diagram; the diagram papers being ruled in upper and lower portions. The registrations of the same moment of time are thus to be found vertically, one over the other; so that the filter-bed resistance for the rate of flow at any moment may be seen at a glance.

The great value of this arrangement is not only for efficient filtration, and the necessity for having a constant rate of flow, but it is also necessary to see that there is no sudden drop in the filter-bed resistance, which would mean that there had been penetration of the bacterial skin lying on top of the sand, which is chiefly responsible for the work to be done.

As regards the sensitiveness and accuracy of the Venturi meter working under any head, there can be no question; the Venturi tube having passed the experimental stage. The resistance recorders are most simple, and are working perfectly accurately and satisfactorily. The pressures are taken above and below the sand; and any increase in the resistance of the beds is immediately shown on the diagram. This method of recording the resistance of the sand-beds is of the greatest value, as the foreman in charge of the filters, having the diagram constantly before him, sees the actual rates of filtration at any moment. No errors are therefore possible.

The head at which the installation is working to which I refer is only 7·25 feet, which has proved sufficient for the absolute accuracy of the registration of all the recorders. There are numerous examples now at work in England of the same type as the above.

Nov. 13, 1907. R. S. V. P.

The Abandonment of the "Technolexicon."

"A Collaborator" writes: "It is not surprising that the Society of German Engineers should find it necessary to abandon this ambitious work, which, if carried out in accordance with the original programme, would fill a whole library. How many technical terms there are in connection with the iron manufacture alone, from the ore to the finished bar! But it would be a pity that the materials, collected with so much care and labour by so many collaborators, should be lost to the world. What the Society should do is to publish a volume of terms in one branch of industry—gas making, for instance—the receipts from which would permit of the publication of another, and so on. Would not Mr. Carnegie give the matter a start?"

LEGAL INTELLIGENCE.

SUPREME COURT OF JUDICATURE—COURT OF APPEAL.

Friday, Nov. 15.

(*Before the* LORD CHIEF JUSTICE *and Lords Justices* BUCKLEY *and* KENNEDY.)

Colne Valley Water-Works Company v. Hall—Liability for the Repair of a Service-Pipe.

This was an appeal of the plaintiffs from the judgment of Justices Darling and Phillimore, affirming the decision of the Judge of the Watford County Court. The short point was whether the plaintiffs could recover from the defendant the cost of necessary repairs to a service-pipe which conveyed water from their main into a house occupied by him. The repairs in question were executed in the portion of the service-pipe lying between the Company's main and a meter; the whole of such portion and the meter being situate outside the defendant's premises, and beneath the soil of a public highway. On Aug. 28, 1905, a leakage was discovered by the Company's servants in this portion of the service-pipe, and the same day they caused a notice to be served upon the defendant to do the necessary repairs. In October, 1905, a further leakage in the same portion of the pipe was discovered; and the Company thereupon served the defendant with a second notice. He did not comply with either of the demands; and the Company thereupon did the work themselves, and sought to recover the costs incurred—viz., 12s. 4d. and £4 2s. 4d. The proceedings in the Court below were reported in the "JOURNAL" for Jan. 29 last (p. 291).

Mr. M'CALL, K.C., and Mr. ROBERTSON (instructed by Messrs. Murray, Hutchins, and Stirling) appeared for the appellants; Mr. HORACE AVORY, K.C., and Mr. BARTLEY DENNIS (instructed by Messrs. Fisher and Stephens) represented the respondent.

Mr. M'CALL having stated the facts, and read the judgments of the County Court Judge and the Divisional Court,

Their LORDSHIPS pointed out that there was no evidence as to who laid this particular pipe; all they knew was that it was taken over from the Harrow Water Company.

Mr. M'CALL said the pipe was laid by that Company.

The LORD CHIEF JUSTICE said if they were to assume that the pipe was laid under the terms of the Harrow Company's Act of 1883, they could not assume that the defendant had permitted to get out of order a pipe which he was bound to repair. The case raised a very important question, which would have to be decided some day; but here the facts had not been proved.

Mr. M'CALL said he understood the pipe had been laid by the Harrow Gas Company, at their own expense, some time before 1873, and it was afterwards sold or transferred by them to the defendant.

The LORD CHIEF JUSTICE: Is that admitted?

Mr. AVORY: No; on the contrary, we have clear evidence that they never sold it at all. It was taken over because it was found there.

The LORD CHIEF JUSTICE said he could not assume that the pipe belonged to the consumer.

Mr. M'CALL: To have the facts found as the Company say they are would enable them to raise a question which is of the greatest importance to water companies and consumers.

Mr. AVORY said the defendant, being only a milkman, could not afford to have this treated as a test case.

Lord Justice BUCKLEY supposed that if the Company liked to make this a test case, and would bear all the cost of so doing, Counsel would not object.

Mr. AVORY replied that personally he should not. It had been ascertained that nothing had been paid by Mr. Hall for the pipe.

Mr. M'CALL said he was extremely anxious that the case should be decided on the broader grounds.

The LORD CHIEF JUSTICE pointed out that the Court could not decide it on the facts before them.

Lord Justice BUCKLEY: If you wish to raise the point, you must bring another action and prove your facts.

Mr. M'CALL desired to argue the case on the basis that the pipe belonged to Mr. Hall; and he submitted that the burden of proof was on that gentleman to show that the pipe was not his.

Lord Justice BUCKLEY: The material fact necessary for your case has not been proved.

Mr. M'CALL said he should submit, in the absence of evidence to the contrary, that the pipe was the property of the consumer up to the main. The pipe appeared to have been laid under the provisions of the Harrow Act.

The LORD CHIEF JUSTICE: All we know is that the Colne Valley Company have a pipe which is subject to the provisions of their Act of 1873.

Mr. M'CALL: It was taken over by them.

The LORD CHIEF JUSTICE: That has not been proved.

Without calling upon Counsel for the respondent, their Lordships dismissed the appeal, with costs.

SHOREDITCH COUNTY COURT.—Tuesday, Nov. 12.

(*Before His Honour Judge* SMYLY, K.C.)

An Appeal Granted in the Hoxton Gas-Poisoning Case.

To-day an application was made to his Honour for stay of execution, pending an appeal, in the above-named case, the proceedings in which were reported last week (p. 502).

Mr. NEILSON (instructed by Messrs. Monier-Williams and Robinson), who appeared for the Gaslight and Coke Company, said they wished to have the opinion of the Divisional Court on certain points which were of great importance to them. He was aware that his Honour did not try the case; but doubtless he had made himself conversant with the main outline of it.

Judge SMYLY said he had had an opportunity of reading through the notes taken by his deputy, which put the facts clearly before him.

Mr. NEILSON drew his Honour's attention to the grounds of negligence put forward by the plaintiffs. These were: First, that there was under the defendants' gas-main a hollow in the earth which was revealed when the main was stripped; secondly, that there had been no inspection of the mains. In this connection, he wished to point out that they were some 24 inches under the roadway.

Judge SMYLY remarked that he did not see very well how they could expect them to be inspected, under the circumstances.

Mr. NEILSON quite agreed. The third ground of negligence was that, inasmuch as steam-rollers were, from time to time, used by the Local Authorities, to the knowledge of the Gas Company, it was the duty of the Company to make inquiries of the authorities as to when and where they were going to use them. Counsel then proceeded to say that, these being the grounds of negligence, before his Honour addressed the Jury he (Mr. Neilson) asked him if he would confine himself to the following three points, which he considered embodied these suggestions: (1) Was the gas-main broken by the steam-roller; (2) were the Gas Company negligent; and (3), if so, in what respect. These points the learned Judge refused to put to the Jury, and said he should only address them in general terms. This he did; and it was on these three points that he (Mr. Neilson) now asked his Honour to grant him leave to go to the Divisional Court.

Mr. COX-SINCLAIR, who appeared on behalf of the plaintiffs, said he must oppose the application. It could not be suggested that the escape of gas was inevitable; and in any other event there must be negligence on somebody's part. The Gas Company had put all their evidence before a competent Jury, and had alleged that there might be negligence on the part of the Borough Council. But the Jury had found that the negligence was on the part of the Company; and in these circumstances he opposed a stay of execution.

Judge SMYLY: I am bound to admit that, except that an allegation was made of a hole under the gas-main, I cannot see, from the evidence before me, that there was any negligence. Then, again, men were supposed to have seen the hole and the broken main before the ground was opened, according to some of the evidence.

Mr. NEILSON: Yes; two of them swore as to inaccurate time.

Mr. COX-SINCLAIR: I do not think a great deal can be made out of that, because the men might easily have mistaken an hour or so. Anyone is liable to such an error.

Mr. NEILSON: But these men were on their road to work, and they ought to have known about what time that would be. One of them swore he saw the hole opened and the pipe taken out, the hollow being underneath; whereas our Engineer did not arrive on the spot to start opening the ground until a quarter past nine.

Mr. COX-SINCLAIR: Anyway, there was evidence given by your own witness which indicated that there was a subsidence of some sort which accounted for the broken main.

Mr. NEILSON: Pardon me. The only suggestion made was that road "made soil" was liable to silt.

Mr. COX-SINCLAIR: I think it was Mr. Foulger who said something about compression at the top and tension at the bottom of the gas-main, which means a subsidence of some sort.

Judge SMYLY referred to the notes of this witness's evidence, and said it was obvious that some remarks of the description stated had been made, which meant an engineering indication that a subsidence had occurred.

Mr. COX-SINCLAIR said there was another point upon which he wished to oppose the application, and that was that there had been no inspection of the gas-mains at the time they were taken over from the old Company. He submitted that this was clearly negligent.

Judge SMYLY: I think you will find a great deal of law in connection with a water-main at Manchester which meets that suggestion. It was contended there that the main was an old one; and it was said that an inspection should have been made. Lightning went through the house and into the ground, bursting the pipe; and on the case reaching the Court of Appeal, they upset the whole of it, and said it was not sufficient ground to suggest negligence because an inspection had not been made of an old main when taken over. I am of opinion, under all the circumstances, that this is a case that should be argued further; and I will grant leave to appeal. [To Mr. Neilson:] Of course, I presume that your clients are prepared to bring into Court the amount of the damages?

Mr. NEILSON: I am entirely in your Honour's hands. We only desire to get to the Divisional Court to settle these points.

Judge SMYLY: Then I will grant a stay of execution, with leave to appeal within 21 days, on payment into Court of the damages and the Solicitor's costs.

Mr. COX-SINCLAIR said he took it that his Honour did not express any opinion in regard to the case.

Judge SMYLY: No; I simply say that I consider it a case that calls for further discussion.

WESTMINSTER COUNTY COURT.—Wednesday, Nov. 13.

(*Before His Honour Judge* WOODFALL.)

Metropolitan Water Board v. Cotton Seed Company, Limited. Question of Jurisdiction.

This was a case in which the Metropolitan Water Board sought to recover from the Cotton Seed Company, Limited, of Cubitt Town Wharf, E., the sum of £49 12s. 6d., being a quarter's water-rate to March, 1906. The point in dispute was whether the Board could recover for water used in extinguishing a fire, such water having been drawn by the fire brigade through the defendants' meter, instead of direct from the Board's fire main. The merits of the case, however, were not gone into before Judge Woodfall, as the proceedings fell through on a plea of no jurisdiction.

Mr. A. B. SHAW appeared for the plaintiffs; while the defendants were represented by Mr. GEORGE KEBBELL.

Mr. KEBBELL, immediately the case was called on, took objection that it was outside the jurisdiction of the Westminster County Court. He pointed out that the demand notes of the Board and their receipts both distinctly stated that payment of the rates was to be made to the collector at an address in or about Poplar, or at the City receiving office in Broad Street Place. Nowhere was there a requirement by the Board that the money should be paid at Savoy Court—the head office; and, as a matter of fact, if the defendants had attempted to pay the rates there, they would have been refused. The defendants' premises were not within the jurisdiction of the Court; and the notices stated that they were required to pay the money outside the jurisdiction of the Court.

Mr. SHAW suggested that, under the Water-Works Clauses Act, the obligation was to pay the Board; and they resided at Savoy Court. He maintained that the Board were entitled to say, "You must pay me at my head office."

Mr. KEBBELL: The only two places they are required to pay at are Poplar and Broad Street Place, City.

Mr. SHAW: Under the contract, I say the place of payment is "the head office."

Mr. KEBBELL: The contract is one relating to the old East London Company; and the head office of that Company, of course, was in the City.

Mr. SHAW said a letter was always sent from the head office of the Board before summonses were applied for; and such a letter was sent to the defendants in January last. It was from the Comptroller of the Board, at Savoy Court, and asked for payment of £49 12s. 6d., for one quarter's water-rate to March, 1906; and it stated that, unless the sum was paid to him within three days, legal proceedings would be taken for recovery without further notice.

Mr. KEBBELL argued that this was not sufficient to give jurisdiction.

Mr. SHAW, however, maintained that the legal obligation was to pay at the head office. The only thing that could be relied upon, he said, to alter the effect of the contract was the Water-Works Clauses Act, section 70 of which simply required the money to be paid. It did not specify the place, but merely said the rate was to be paid to the creditor. He did not pretend that if the contract was outside the jurisdiction of the Court the letter he had just quoted would alter the fact. The Board, as he submitted, had never varied their right to request payment at the head office. The collector attended to receive rates at Broad Street Place; and remittances might even be sent to his private address. This, however, merely meant that the Board said: "You need not send the money on to the head office, if you prefer to pay in one of the alternative manners." It was no more a legal waiver to pay at the head office than if a collector was sent round to look after the money. If the consumers did not pay in any of the alternative ways, the Board said, "Now I make a formal demand, and you must pay me. You have not availed yourself of my agents, and now I make the demand for payment." And the Board went on to state that payments had to be made to the Comptroller. His point was that the Board did not alter the legal place of payment by saying a collector would call, or that the money might be sent to the collector's private residence or to the district office. It was merely for the consumer's convenience that this could be done. The legal place of payment was under the contract. The Metropolis Water Act of 1902, section 15, clause 1, stated that "There shall be established a water fund, and all receipts of the Water Board shall be carried to that fund, and all payments by the Board shall be made out of that fund." Everything had to go into the fund. A man could send his water-rate to the head office at any time, if he liked, the same as he could pay his borough rates at the council offices instead of to the collector.

Mr. KEBBELL: I have offered payment on many occasions at Savoy Court; and it has been refused in every instance.

His HONOUR: Had the defendants previously paid at the places named on the demand notes?

Mr. KEBBELL: Always; even since the Board came into existence.

Mr. *S. C. Robertson*, who had for the past six years occupied the position of Secretary to defendant Company, said he did not recollect

ever having paid the water-rates at the East London Company's head office. He could not say definitely; but, so far as his memory went back—a period which he gave as two years—remittances had been sent to the collector. They paid the rates wherever they were required to do so; and he could produce the collector's receipts.

His HONOUR said the plea of want of jurisdiction must prevail. It seemed to him clear that the place of payment was stipulated for, and accepted by, the defendants—previous rates have been so paid. The place of payment indicated was accepted by the consumer; and, this being so, there was a stipulation between the parties. The case was therefore outside the jurisdiction of the Court; and the objection must be upheld, with costs.

Mr. SHAW remarked that, with reference to Mr. Robertson's evidence, the collector (Mr. Adams) signed the receipts because he was collector. The fact that he had to give a receipt did not show that the defendants sent him personally the cheque. He then called

Mr. *Henry Light*, a clerk in the Solicitor's Department of the Metropolitan Water Board, who said he made the affidavit, and that the material fact relied on as constituting the alleged cause of action was that the Water-Works Clauses Act of 1847 placed upon the debtors, as persons receiving a supply of water, the obligation of paying the rate. This they failed to perform at the office of the Board in Savoy Court.

Mr. SHAW: You say there was an obligation on the part of the defendants to pay at Savoy Court.

Mr. KEBBELL: You know all the demand notes of the Board require payment to the collector.

Witness: No, they do not. Many are sent out from Savoy Court.

Mr. KEBBELL: Have you got any machinery for receiving rates at Savoy Court?

Witness: We give receipts there.

His HONOUR: The truth is the plaintiffs must know very well the defendants never paid their rates at the head office.

Mr. SHAW: Our instructions are that they paid the East London Company at the head office sometimes.

Mr. *Adams*, a collector to the Board, said he signed receipts; but he could not say whether the defendants sent to him personally the amounts for which he gave receipts. They may have been sent to one of the other offices. In the case of the remittance being sent (say) to Rosebery Avenue, it would be forwarded on to him, and he would give a receipt. It was part of his duty to issue receipts for all payments made by consumers in his district, whether sent to him or to another office. Payments might be sent to him, to any of the district offices, or to the head office.

Mr. KEBBELL: Did you ever know a consumer to pay at the head office, and then for the amount to be sent on to you?

Witness: No. The head office would in that case issue a receipt and advise me of the payment.

His HONOUR: That would be out of the regular working?

Witness: I believe in all cases where rates go to the head office they issue receipts.

Mr. KEBBELL: Will you swear they have an office to receive rates specially?

Witness: I have not been there to see. If a man goes to pay his rate at Savoy Court, they give him a receipt.

How many consumers have you in your district?—About 5000.

Out of that 5000, how many have you ever known to pay at Savoy Court?—Perhaps 100 or 200. I cannot say exactly how many.

His HONOUR: I do not see anything in this evidence to make me alter the decision I have arrived at.

BRECONSHIRE QUARTER SESSIONS.—Thursday, Nov. 7.

(*Before the Hon.* R. C. DEVEREUX, *Chairman, and a Bench of Magistrates.*)

Assessment of the Swansea Water-Works at Cray.

To-day an appeal was opened by the Swansea Corporation against the rating of their new water-works in the parishes of Cray and Glyntawe by the Assessment Committee of the Brecon Union. The present gross estimated rental for the works in the parish of Cray is £16,524, and the rateable value £12,852; and for the parish of Glyntawe the figures are £823 gross and £640 rateable.

Mr. S. T. EVANS, K.C., M.P., and Mr. RHYS WILLIAMS appeared for the appellants; Sir EDWARD BOYLE, K.C., M.P., Mr. W. C. RYDE, and the Hon. H. C. BAILEY represented the respondents.

Mr. EVANS when proceeding to open his case, said the gross estimated rental value for the Cray parish was £16,524, and the net rateable value £12,852, and for Glyntawe £823 gross and £640 net; and it was in respect of a reservoir of 100 acres of water, and the dam and portions of the tunnel and pipe-track. The entire undertaking was in about ten parishes and three Unions—viz., the Brecknock, Pontardawe, and Swansea Unions. The whole of the Swansea water supply was obtained from the Velindre district; and the total watershed was 2680 acres, or just 40 acres less than that at Cray. The storage capacity of all the reservoirs was 512 million gallons, against 1000 million gallons at Cray. The problem for the Court to work out was what would be the full annual value of the entire undertaking if let to a hypothetical tenant; and the Corporation basis was worked out upon the gross receipts and expenses less the occupier's share of the profits. Taking the figures for the year ended March 31, 1906, the gross annual rental value of the Cray works was £27,951; and the working expenses came to £2402. This left £25,549, which was the annual rental value of the Cray works to a hypothetical tenant. From this, £2899 should be deducted as the occupier's share of the profits; leaving a gross estimated rental value at £22,650, including rates. This sum was in respect of three Unions; and in the Swansea Union, from ascertained figures the gross estimated rental value was £10,617, and in the Pontardawe Union £4628, making £15,245 from the two Unions. This sum deducted from the £22,650 left £7405, including rates, as the gross rental to be divided between the parishes in the Brecon Union. The Assessment Committee, however, said it should be nearly £18,000.

Mr. *R. H. Wyrill*, the Borough Engineer of Swansea, gave details, not only with respect to the Cray works—the reservoir, tunnel, pipe-track, &c.—but also as to the older water-works of the Corporation situated in the Pontardawe and Swansea Unions. He said the Cray catchment area comprised 2680 acres. Witness's original estimate of the cost of the works at Cray was £270,000, and they cost £547,000. The difference between his original estimate and the actual cost arose principally from the depth of the excavations in consequence of fissures in the old red sandstone. Owing to this cause, they were obliged to go 30 feet below the depth on which he based his original estimate. The actual cost of the works was £547,252. The reservoir had an area of 100 acres of water, the depth of water at the dam being 100 feet. Of the total cost of the works, he allocated to parishes in the Brecon Union £453,537, to the Pontardawe Union, £59,494, for the pipe-line only; and to the Swansea Union, £22,375 for the pipe-line, and £11,846 for the service reservoir.

Alderman *Martin* said the Swansea Corporation would not have gone near Cray if they had known the water-works there would have cost £547,000.

Sir E. BOYLE: Do you think you wasted money in constructing the reservoir?

Witness: I have no knowledge of any money actually wasted.

You think you have got value for your money?—Well, as things go, I do; but, having set our hands to the plough, we could not turn back. It has cost us more than we anticipated.

Friday, Nov. 8.

On the resumption of the hearing this morning,

Mr. *H. H. Hopton*, the Accountant of the Corporation, gave evidence as to the accounts of the water-works.

Mr. *Humphreys Davies* said the assessment of the works in the Brecon Union was more than the gross receipts from the whole undertaking, located not only in Breconshire but in Glamorganshire as well.

In cross-examination by Sir E. BOYLE, witness said every figure had been given to the respondents prior to the appeal—on May 3 last.

Mr. *Herbert Fuller* gave evidence to the effect that the gross amount at which the appellants were assessed in the Brecon Union was £17,936; while the rateable value was £13,950. Having regard to the effective value of the whole concern, witness calculated that the gross estimated rental of the works in the three parishes concerned should be £6099, and the rateable value £2113.

In reply to Mr. RYDE, witness explained that his figures were based on the receipts and expenditure of the whole undertaking.

This concluded the case for the appellants.

Sir E. BOYLE intimated that he did not intend to call witnesses; remarking that he and his clients had proved their case out of the mouths of the witnesses for the appellants.

Mr. EVANS quoted figures given by Mr. Humphreys Davies and Mr. Fuller, and contended that the appellants had been greatly over-assessed as compared with Cardiff. The total at which they were assessed in the Brecon Union was £17,936 gross estimated rental and £13,950 net rateable value; but the evidence of Mr. Humphreys Davies showed that the gross estimated rental for the works in Breconshire should be £7405, while Mr. Fuller set it down at £6099, and the rateable value at £2113. He trusted the Court would deal with the assessment of the property on a fair and equitable basis; otherwise he feared there would be nothing but appeal after appeal.

Sir E. BOYLE, in addressing the Court, contended that the rateable value of the undertaking of the Corporation in the Breconshire parishes should be £13,950—remarking that percentage on cost was the only method by which they could arrive at a fair annual value of the property they had to assess.

The CHAIRMAN announced that the appeal would be dismissed, with costs.

Mr. EVANS asked the Court to state upon what basis they arrived at their decision, so that the opinion of the Court above on the matter—especially as only one side had given evidence in the case—might be obtained; otherwise there would be no finality.

Sir E. BOYLE said it seemed to him that it was more a question of fact than of law, and therefore he hoped the Court would not state a case. If, however, they decided to do so, he, of course, would bow to their decision.

The CHAIRMAN (after considering the matter) said the Court declined to state a case. The appellants might appeal against the net rate.

Mr. EVANS said he hoped that costly course would be avoided; but he was afraid it was the only one the Corporation could adopt.

This concluded the proceedings.

Cleverley v. Gaslight and Coke Company.—In the Court of Appeal, on the 10th of June, there was an appeal by the Gaslight and Coke Company against a decision of the Deputy-Judge of the Romford County Court. A man named Cleverley met with an accident on Feb. 12, 1905, while working a hauler, which broke, causing him to fall and hurt his neck. As everyone assumed that the accident was the result of the fall, the usual agreement was made and filed in the County Court. In the following year Cleverley died. His death was not the result of the accident, nor was it accelerated by it; but the Deputy County Court Judge held that he died as the result of the accident by estoppel. The way in which estoppel was found was this: The Judge said the agreement was founded on the assumption that the man was incapacitated by the accident; but it had since come to light that he died from lympho-sarcoma. It was contended, on behalf of the Company, that, even assuming that the agreement bound the Company to admit for ever afterwards that, in point of fact, the incapacity was due to the accident when the document was signed, this did not hinder them from saying at a later period that Cleverley was no longer suffering from the accident, or the result of the accident. In the result, their Lordships came to the conclusion that estoppel did not apply, and allowed the appeal. The case was taken *in formâ pauperis* to the House of Lords, where it was heard yesterday, with the result that, without calling upon the respondents, the appeal was dismissed. A report of the proceedings will be given next week.

COUNTY OF LONDON QUARTER SESSIONS.

SESSIONS HOUSE, CLERKENWELL.—Monday, Dec. 17, 1906.

(Before Mr. R. LOVELAND LOVELAND, K.C., *Chairman, and a Bench of Justices.)*

Metropolitan Water Board v. Assessment Committee of the City of London Union.

In last week's issue (p. 503), a report appeared of the first two days' proceedings in the appeal by the Metropolitan Water Board against assessments by the Assessment Committee of the City of London Union, at the quinquennial valuation of 1905, which is still before the Court; and a summary of further evidence is given to-day. The appeal is in respect to 101 out of the 114 parishes contained in the City of London Union.

Mr. DANCKWERTS, K.C., Mr. HORACE AVORY, K.C., and Mr. BOYDELL HOUGHTON (instructed by Mr. Walter Moon) appeared for the Water Board. The Counsel for the City of London Union were Mr. BALFOUR BROWNE, K.C., Sir EDWARD BOYLE, Bart., K.C., and Mr. WALTER C. RYDE (instructed by Messrs. White and Leonard).

Mr. *F. E. Harris*, the Comptroller of the Water Board, was re-called, and, in further cross-examination by Sir EDWARD BOYLE, said he knew very little about the New River Company prior to the Board coming into existence. He was, however, aware that there had been an increased revenue every five years. On the other hand, he declined to admit that the expenses of carrying on the undertaking had been largely reduced since the Board came into possession. It was true that the consolidation of the administration was carried out with the idea of ultimately reducing the expenditure; but, at the same time, the Board had to incur outlays which the Companies did not. He was not prepared to say that the expenses of the Board at present were any less than were those of the whole of the Companies. There were the cost involved by the appointment of a certain number of new officials, the renting of central offices, and other matters. Certainly a larger number of officials had been withdrawn than had been appointed; but the Board had been saddled with the cost of the pensions. He was unable to say the price that was obtained by the New River Company per 1000 gallons, and therefore could not state whether or not it was very much more than was received by any other Company.

Mr. DANCKWERTS: What are the figures you are asking about—those of the old New River Company? They are different now that Tottenham and Enfield are in.

Sir EDWARD BOYLE: I am dealing with the old New River Company for the moment. I think we have really much to do with the New River Company, because, of course, we can only go on the last completed accounts; and the last completed accounts were while the concern was the New River Company pure and simple.

Cross-examination continued: The equalization of the water-rates over London would probably result in an increase in the New River district. As to why the undertaking in the hands of the Board should have less rateable value than in the hands of a Company, he should, with his limited knowledge of the matter, imagine this was because they were the only possible tenants.

Sir EDWARD BOYLE: Supposing a man has three collieries—one at Doncaster, one at Derby, one at Sheffield. They all belong to him; and he chooses to muddle up his accounts so that no one can——

Mr. DANCKWERTS: I really must object. What is the relevancy of this? The Act of Parliament says they shall keep their accounts as one.

The CHAIRMAN: I think we must always bear in mind the Act of Parliament, and the way in which those who act under it are bound. Any question which does not go on all-fours with the Act would be irrelevant. "Muddling up accounts together"—when you commence a question in that way, I cannot see how that has reference to the particular details of this case, where there is no muddling up of accounts. They are only acting under statutory powers.

Sir EDWARD BOYLE: They could, if they liked, fulfil all the requirements of the Statute, and at the same time keep their books so as to know the position of each district.

The CHAIRMAN: I do not see how at present. I am told that the boundaries are different, the receipts and expenditures are different, and there is one common pool.

Sir EDWARD BOYLE: The boundaries, as far as the charges are concerned, have not been altered.

The CHAIRMAN: But there is Enfield, and also Tottenham. Tottenham is an enormous district.

Mr. BALFOUR BROWNE: Those are charged under their own Act. At the present time, the Water Board are charging the New River district under the New River Act. They have only power to charge in the New River district under the Act, and not under the Transfer Act. Therefore we have a right to know what they are charging. They have no right in Enfield and Tottenham to charge any rates but those authorized under the Enfield and Tottenham Acts. Therefore they must keep them separate.

Mr. DANCKWERTS: That is wrong. Under the 1902 Act, we are to charge on the New River scale in those districts.

Cross-examination resumed: The amount of "B" Metropolitan Water Stock issued was £34,118,849, and of "A" Stock £6,060,165. Both these were 3 per cent. There were also redeemable debenture stocks transferred to the Board, £7,217,838, and some mortgage loans £37,500. The total capital liability, or, in other words, the funded debt, of the Board at the present time was £47,434,351. In addition to this, there were some terminable and perpetual annuities which were transferred under the Act to the Board. Including these annuities, the total annual interest payments of the Board were 1,435,994. The rates paid by the Board, extending over some hundreds of parishes, came to nearly £400,000 a year.

Sir EDWARD BOYLE: Can you tell me the rateable value of the eight Companies before the amalgamation—in 1900? We have got it as far as London is concerned; but we want it split up between London and Outer London.

Mr. DANCKWERTS: My learned friends seems to have fallen in great confusion of mind, if I may be allowed to say so, with all respect to them. To begin with, the area of the Board is not identical with the areas of the Companies; and therefore all sorts of adjustments have to be made for that. Enfield and Tottenham have been put in; Croydon and Richmond have been dropped out; Chessingham and Sunbury have been included; and there are a number of districts which a Company might supply, but which, under the Act, the Board are forbidden to supply. Thus there is no identity between the two; and therefore I submit the argument (if any) that is derived from a comparison of 1900 and what it should be now, is so little calculated to assist the Court that it is not worth while going into it.

The CHAIRMAN: We could not be bound by it. My impression is that it will not help us.

Mr. BALFOUR BROWNE: My learned friend, Mr. Danckwerts, in opening the case, said there were various ways of getting at the rateable value of the whole undertaking, which he claims is what the Court have to do. He said there were various ways of apportioning the rateable value between the parishes. I agree with him. One of those ways, he said, was upon the amount of apparatus in the parish; but he did not think this fair. On the other hand, he thought that to take it on the receipts would be fair. Therefore I assume he is going to do it according to the receipts; and I want to know what the receipts of the Water Board are in every parish.

Mr. DANCKWERTS: They are all agreed.

In re-examination by Mr. HORACE AVORY, witness explained at length why it would be impossible to allocate the expenses of the whole Board to the different districts. It could not be taken, he said, otherwise than as one concern.

Mr. *Ernest Collins*, formerly Engineer in charge of the distribution works of the New River Company, and now Engineer of the New River district of the Board, examined by Mr. HORACE AVORY, said the whole system of supply was interchangeable. The supply of water in the City was very expensive, on account of the nature of the paving in the streets. The whole of the City was paved with wood and asphalt; and in making any repairs this had to be broken through, and the cost of reinstatement was very heavy. Then, again, owing to the traffic, all work, where possible, had to be done at night, which meant double pay, and very often on Sunday. If any large work had to be done, too, the City authorities made them carry it on night and day, with double shifts. The arrangements in case of fire, also, were elaborate.

Cross-examined by Mr. BALFOUR BROWNE: With regard to the fire provision, the Corporation paid nothing extra for hydrants. He could not give the supply per head in the City, nor the quantity per service. Over the whole of the New River district, the average ran to about 30 gallons per head; while the average over the entire area of the Board would be about 35 gallons per head. Naturally, baths were rare in the City, as compared with the residential districts of London. As against this, however, the immense number of restaurants, eating-houses, &c., used a very large quantity of water. There was no doubt that (say) in Lambeth the charge from the point of view of rateable value was higher than in the New River district; so that for the purpose of charge the districts under the Water Board were still separate. Part of Tottenham was formerly supplied by the New River Company; and part of Enfield was still supplied by the Barnet Company.

Mr. DANCKWERTS: Throughout the evidence that we have been giving, we have avoided any that would bear upon the profit-making system of valuation. We did this for two reasons. In the first place, it conduced to clearness, if we limited the evidence each to its proper head; and, in the next place, we thought it advisable to postpone giving the evidence on the third head until it should be clear, or until your Lordship should direct, that the time has come for giving it. I propose to continue that for the present at all events, and now to call the Surveyors.

Mr. BALFOUR BROWNE: Of course, my learned friend will conduct his case in any way he desires; but I deprecate very much cutting it into three. My learned friend has gone upon a principle that he thinks he can justify—namely, taking the capital value of the whole, and the interest thereon. I entirely differ from this as a principle. Under the Act, you have not to deal with the whole, but with a parochial part of the undertaking; and, further, I say the capital value has no bearing at all, except when we come to deal with unproductive parts of the plant. Our case will be, first, that you must ascertain the receipts—you must take it upon the basis which Mr. Danckwerts has called the "profit basis"—and that, even if we were wrong, it is the parochial part that is to be taken. Suppose we were wrong in that, and that you have to take the whole undertaking, even that must be taken upon the profit basis. I believe I am right in saying that the profit basis was the only one which was put by the Surveyors before the Assessment Committee. Upon this, the Water Board said they could justify a reduction of the rate. Now we are to have an entirely different principle applied; and we are to be apparently precluded from going into the profit basis at all. My learned friend must finish his case before I begin.

The CHAIRMAN: My colleagues agree with me that, however long the process may be, we must hear the whole case, and ask Mr. Danckwerts to give us his alternatives in all the three methods that he proposes. Then we shall have to hear the other side, and determine which set of figures or which principle we shall adopt.

Mr. *Frank C. Ryde*, examined by Mr. HORACE AVORY, said he had made a valuation based on the capital value of the undertaking distributed among the different parishes which were concerned in the appeal. He put the capital value of the mains in the City of London at £66,091, and the estimated capital value of those in the 101 parishes appealed against at £58,554. It was impossible to get the length of all the mains in each particular parish, so he was obliged to divide the total by the number of parishes. It could not, of course, be accurate. Then he arrived at the rateable value by applying 3½ per cent. to the capital. This, he thought, was the highest rent which the only possible tenant (the Water Board) would be willing to pay for the undertaking, if it was based on the rate at which they could borrow money. This 3½ per cent. came to £2049, to which he added £512 for statutable

deductions—making the gross value £2561. This represented the actual cost per annum to the Board of providing such works as he found in the City; but, of course, they had to deal with the matter on the basis of a period of years, and it was quite possible that at some future time they might be able to raise money at 3 per cent., or even less, so that 3½ per cent. was really a liberal allowance. The rateable value appealed against was £55,108; and that asked for in the notice of appeal was £32,277. He had prepared a second valuation on the basis of the capital value of the whole undertaking distributed among the various parishes which were appealing, according to the gross receipts in those parishes. This was simply an alternative; and he thought it was a wrong method. The total value of the whole undertaking (including land) might be put at about £18,000,000. Interest on this at 3½ per cent. produced £630,000. Then there were some miscellaneous parts of the undertaking which were separately assessed, and the assessment of which was not objected to. The rateable value of these came to £12,320; and adding this to the previous figure made £642,320 as the rateable value of the entire undertaking. In order to distribute this on the other basis, it was necessary to make a capital valuation of the unproductive works, land, and mains, which was £15,932,407. Interest on this at 3½ per cent. produced £557,634. Adding the miscellaneous properties already referred to, gave a total rateable value for the unproductive portion of £569,954. Taking this from the £642,320 left £72,366 as the rateable value of the productive mains. This worked out at 2·7 per cent. of the gross receipts of the whole undertaking. The gross receipts in the 101 City parishes appealed against were £144,515; and 2 7 per cent. of that was £3902. Then there were certain unproductive mains in the City which, at 3½ per cent. on their capital value, worked out at £1223. Adding these two figures together gave the rateable value of the mains as £5125 for the 101 parishes, as against £2049 on the other basis; but in either case the figures were far below the amount appealed against.

Mr. BALFOUR BROWNE: As against £32,277, which is the amount they say it ought to be.

Mr. HORACE AVORY: That is admittedly upon the profit-earning basis. We are now giving you the figures as they work out upon the proper basis, as we say, instead of upon the profit basis.

The CHAIRMAN: Although you did not ask for it.

Mr. HORACE AVORY: Neither my friend nor I was before the Assessment Committee.

Examination continued: The total capital value of £18,000,000 was arrived at by valuing all the works, pumping-stations, reservoirs, filter-beds, &c.; while the valuation of the mains was made by taking the lengths and diameters and pricing them out. In addition to his own valuation, engineers were specially retained for the work. When he went before the Assessment Committee, and put in the valuation of £32,277, it was on the assumption that the Board were in the same position as one of the old Water Companies. They were, of course, guided by Counsel; and at that time he did not think the point as to whether or not the Board were a profit-making body had come forward. Mr. Eve, who appeared for one of the Assessment Committees, raised the point; and the Board took Counsel's opinion on it.

The CHAIRMAN: But are you not bound by those figures? We could not assess them lower.

Mr. HORACE AVORY: I quite agree we cannot on this appeal ask the Court to put them below that. But we can show that the figures ought to be lower; and that therefore they cannot possibly be more.

In further examination, witness handed in his valuation on the third alternative—the profit basis, which was the one placed before the Assessment Committee. This was based on the accounts for the year ending March 31, 1906. According to this, the gross receipts were £2,761,010; and taking from this the working expenses (*ex* rates), £714,543, the net receipts, *plus* rates, came to £2,046,467. Deducting occupier's share (8 per cent. of the gross receipts), there was a gross value, *plus* rates, of £1,825,586. From this had to be taken statutable deductions, £217,796, leaving a rateable value, *plus* rates, of £1,607,790. Deducting rates at 6s. 9d. in the pound (£405,704), there was left a rateable value for the whole undertaking of £1,202,086. As already shown, the rateable value, *plus* rates, of the whole concern was £1,607,790. Taking for this the rateable value of the unproductive portion (£788,000) and rates on that portion (£265,950), there was left a rateable value, *plus* rates, of the unproductive portion of £1,053,950 —leaving the rateable value, *plus* rates, of the productive portion as £553,840, or equal to 21 per cent. of the total water-rental (£2,651,209). The gross receipts in the 101 parishes appealed against were £144,515; and the rateable value, *plus* rates, of the productive mains calculated at 21 per cent. on the gross receipts was £30,348. Deducting rates at 7s. in the pound, the rateable value of the productive mains stood at £22,480. If to this was added the rateable value of the unproductive mains (£1748), the total rateable value in the 101 parishes came to £24,228. Adding statutable deductions, £6057, they arrived at a total gross value of £30,285.

Mr. HORACE AVORY: In what way do you arrive at the occupier's share?

Witness: The occupier's share represents 8 per cent. of the gross receipts. In arriving at the occupier's share, it always seemed to me there were two things a tenant would have to consider. In the first place, he would have to take into consideration the amount of capital he would have to put into the concern, and he would have to assure himself that he was going to get a satisfactory return on the capital. Generally, in this Court the return is put at 17½ per cent. But there is also another consideration which the tenant would have to look at; and that is, assuming that he does get 17½ per cent. on the capital, whether even then he will get a sufficient interest in the whole undertaking to make it worth his while to rent such a concern. There are many rateable hereditaments, of which water-works are certainly one, where the amount of tenant's capital involved is very, very small; and therefore even 17½ per cent. on that tenant's capital produces such an extremely low figure compared with the total that it cannot be said that it gives a sufficient interest to the tenant to induce him to rent the entire undertaking. I only put 8 per cent, of the gross receipts. It is a very general practice among surveyors, in arriving at the rateable value of water-works, to estimate the occupiers' share as being represented by 10 per cent. of the gross receipts. I have repeatedly done so myself; and it has been a very general practice. In the present instance, as this is a very large undertaking, and also, as I suppose, the security for the income will be specially good, I thought that there might be some ground possibly for reducing the 10 per cent. But I have never done so in any undertaking before. I have never put the occupier's share below 10 per cent. In the present instance I have reduced it to 8 per cent. because I considered that the revenue was extremely well secured; and also I took into consideration the great magnitude of the undertaking. To arrive at the statutable deductions, I put down the actual amount spent during the account year on the repair and maintenance of the hereditament; and I have also allowed a sinking fund for renewing those parts of the hereditament which would require renewal.

Monday, Jan. 21, 1907.

Mr. *Ryde*, recalled and cross-examined by Mr. BALFOUR-BROWNE, said his second valuation was the same as the first, with merely an alternative distribution. He did not himself think this second method was the right one; but it made very little difference. He did not know as a fact that the whole valuation of the last quinquennial was settled between Mr. Marshall, acting then for the New River Company, and the City authorities; but he would take it that in the rate-book the valuation stood at £49,684 for the whole 114 parishes. Counsel said the receipts in the City had increased from £140,000 in 1899 to £158,000 in 1904, yet it was claimed that the rateable value in the 101 parishes had gone down from about £49,000 to £24,228—the highest figure given—but witness replied that he knew nothing about the figures of years ago. In the interval, however, the Water Board had come into existence. Then, again, during the quinquennial there had been a very large increase in the unproductive works of the water undertaking, all of which were situated outside London. The Staines reservoirs and the aqueduct were not taken into consideration in rating five years ago. The evidence was that water from the Staines reservoirs was being used in the City. Then there were the whole of the new reservoirs belonging to the old East London Company. They practically doubled the storage capacity of the East district; and they might be used to supply the City. It might be that all the intercommunication works were made under the old Companies; but they were not used. That was the point. Then there were some very large reservoirs indeed which had been constructed, and had only recently been opened, in the parish of Walton, on the Molesey side of the river. They were originally intended for the Southwark and Vauxhall Company. In addition, there were a large quantity of new filters at Hampton now being made; and there was a tunnel under the Thames at Hampton for conveying this water through Southwark and Vauxhall engines. The water would be pumped to Battersea, which was an intercommunication station; and from there it would go straight to the New River Head, and probably to the City. He was almost certain, too, that he was right in saying that, since the last quinquennium, at least one new source of supply had been opened by the East London Company—that was to say, a new well and pumping-station. Nobody could say which of these works was directly used for the supply of the 101 parishes; but it was impossible that none of them was. He could not say what was the consumption of water in the City; and even if it could be arrived at, with the cost per 1000 gallons, it would not be the right way to arrive at the net receipts, because there were other considerations which would come in at once. The valuation he made when he appeared before the Assessment Committee differed from his present one, because at that time the only figures he had to go on were those of the old Water Company. His figure of £66,091 for the capital value of the dead mains in the City was arrived at by taking lengths. On the previous occasion, this item had been put at £74,507; but he thought it had been discovered that an error was made five years ago.

Mr. BALFOUR BROWNE: Why do you start with the figure of £18,000,000 as the value of these hereditaments, after the Arbitrators have said that the value was over £40,000,000?

Witness replied that the Arbitrators' value was, of course, the price paid for the undertaking as a going concern. The Board had got the goodwill of the business and the premises in which to carry it on; but they could not earn income like the old Companies had done. This was why he had put the value as £18,000,000. He had a schedule of the unproductive works; but he thought that, in the interests of the Board, he ought not to be called upon to make public what he had valued each one of the separate works at, because practically all of them were outside London, and in a large number of Unions which had nothing whatever to do with this appeal. If they made public what they valued each of these independent works outside London at, any of the authorities who saw the figures, if they found a higher value had been put down than their assessment, would put up the assessment in that particular district. If, on the other hand, they found the works valued at a lower figure, they would simply leave the matter alone. In other words, it would be doing a great injustice to the Water Board if they had to divulge these separate valuations.

Mr. BALFOUR BROWNE said he must press for the production of the figures, because otherwise he could not test the valuation. He would ask the Court to reject the valuation altogether if the particulars he desired were not forthcoming.

The CHAIRMAN intimated that he could not reject the valuation; and, after some further argument,

Mr. DANCKWERTS repeated an offer he had made to allow the other side to nominate one of their experts to see the valuations.

Mr. BALFOUR BROWNE, however, still insisted, remarking that if it were a small figure, of course, he could waive it; but it was an enormous amount - £788,000. If the figures were accurate, the Water Board had absolutely nothing to fear; but if they were not accurate, no doubt there was a particular reason for keeping them secret. If his request was absolutely refused, he would, when he came to address the Court, contend that the sum he had named could not be relied upon at all. He declined the offer to send an expert to see the figures; he desired them produced in open Court.

The CHAIRMAN: Well you will not get them, so you had better proceed.

Cross-examination resumed: The 6s. 9d. in the pound he had deducted for rates was an average, and was arrived at as accurately as possible, being based on the Comptroller's estimate. He had not with him any valuation of the new works that had been recently opened; but he could give the total value of the whole of those that had been brought into operation during the last five years. He could not say what was the average assessment of premises in the City as compared with the whole area. The water charges were not based on the capital value of the properties in the City; in many cases in the City the charge was not based on the rateable value. In some instances, the charge bore no proportion to the assessment. He did not think the Water Board had changed the system as to the payment of water-rates. The old system used to be—the Board's method was identical—to collect the rates half yearly; and they collected one quarter's rates in arrear and another in advance. It was true that the landlord had bought an hereditament with a business attached to it for over £40,000,000; but he had abandoned the business. He had lost entirely the right to make a profit which the old Companies possessed.

Mr. Balfour Browne: Over £42,000,000 has been paid by the landlord. You give him £1,202,000, and the tenant £220,881; and you say the tenant has had to find so little capital that it is not worth while giving him 17½ per cent?

Witness: I do not. I say 17½ per cent. on the tenant's capital comes to such a trifle that no tenant would take the risk for the result.

You give the tenant one-fifth of the whole of the profits of the concern?—I give the tenant 8 per cent. on the gross receipts.

In re-examination by Mr. Danckwerts, witness said the amount paid to the old Water Companies was not for the hereditament, but included goodwill and prospective profits. What the Board had to let was merely the hereditament; and he was satisfied that he could, at the present moment, by the expenditure of about £18,000,000, reproduce the whole hereditament. If this was so, the £18,000,000 was the sum upon which to reckon the interest on capital, as it was what the Board would have to pay interest upon. The reason why he took 3½ per cent. in the one case to get at the annual value of the unproductive part of the hereditament, and 4 and 5 per cent. in the other, was because in the first case he treated it as a non-commercial undertaking, and in the second as a commercial concern—where a man would put into his pocket as much profit as he could make. He went before every one of the Assessment Committees in the whole of London; and there was not one of the valuers acting on behalf of any one of the authorities who ever questioned the 4 and 5 per cent. It was the usual thing for a profit business; and it was done on the two appeals that occurred five years ago, when no one raised any question. When he made his valuation before the Assessment Committee, it was upon the profit basis; and he allowed himself a considerable margin. This was not only to cover the chances of a fight, but also because his instructions from the Board from the very beginning were that he was not to make a valuation which exacted every farthing he thought the Board could claim. There was also the point that, assuming after the notice of appeal had been served the respondents had been at all disposed to come to an agreement, if they were at one with the Board's principle, and saw that liberal figures had been put down on that basis, they would possibly have settled the appeals without coming into Court, which was certainly a thing to strive for. Of course, a mere increase of income did not necessarily prove an increase of profits. He had taken everything into consideration; and in the present instance, of course, on the rateable value of the whole undertaking, the large works which had been added (which were a very serious item) meant so much more hereditament to be kept in repair than five years ago. This item alone, on the question of repairs, would be a reason for reducing the rateable value. Intercommunication was taking place largely. He had seen the Staines water running into the Grand Junction reservoir; and this water they knew also went into the New River district. To his mind, it was not conceivable that the annual value in the hands of the Water Board would be the same as it was in the hands of the Companies; the whole of the circumstances were entirely altered. The concern was being worked as a whole for the general good, and not as eight or ten separate undertakings operated for the special benefit of the shareholders. In the City, the gross receipts did not depend upon rateable value, but largely upon special bargains.

Mr. Danckwerts intimated that, before putting more surveyors into the box, he was going to call the gentlemen who valued the unproductive part of the undertaking other than the mains. They were Messrs. H. E. Jones, Corbet Woodall, and Arthur Valon. Having regard to the numerous works, what they did was to divide them up between them, and then they brought out a joint total. He would show these details to the other side, but not put them on the notes.

Mr. Balfour Browne said that so far as he personally was concerned, he would give instructions that they were not to be disclosed outside. He could not, however, accept the principle of the Board's valuation. The Union had not valued, and were not going to value, the undertaking as a whole. Their contention was that what had to be valued was the parochial part of the undertaking that was in their Union; and this was the way in which they meant to proceed. All he desired to show was that the rateable value in the City was what he placed it at. He wanted to avoid the expense of going into matters which, he argued, had nothing to do with the case. If, however, the Court should determine that the case ought to be taken on the basis put forward by the other side, then the Union should, even at enormous expense, have the means of checking this valuation by going over the works for themselves.

A short adjournment then took place, for the purpose of enabling the respondents to decide what course should be pursued; and on the resumption of the proceedings,

Mr. Balfour Browne said he was not prepared to go into a valuation of the whole of the undertaking; while the Water Board, on the other hand, had not gone into the value of the parochial part. If, however, his Lordship would at once determine what was the method to be adopted, either his learned friend's clients or his own clients could put themselves in a position to conform with the decision of the Court.

A private conference then took place between his Lordship and Counsel, after which the hearing was adjourned.

Monday, Feb. 4.

To-day was fixed for the further hearing of the case; but on the assembling of the Court,

Mr. Balfour Browne said he was not then prepared to go on.

Mr. Horace Avory, on behalf of the Board, said he was ready to continue, and would only submit to another adjournment under protest that it was unreasonable. The respondents ought to have been ready to meet the case the Board had put forward, and they should have been prepared now to put forward their own case.

Mr. Balfour Browne replied that he thought the idea from the first on the side of the Board was that the principle should be determined before the figures were gone into. If the figures upon the basis of taking the Board's property as a whole had to be gone into, this meant a very large expenditure, which his clients would not have been justified in incurring unless they had an indication of the view of the Court. Therefore, so far from being unreasonable, he was taking the very course now that was maintained from the first to be reasonable—that there should be an indication of the principle before they incurred the expense. As to the Unions outside London who were also concerned in appeals, it seemed to him (now that they had an indication that the view of the Court at present was that the undertaking should be valued as a whole, and then distributed into the various parts) simply monstrous that six different bodies should set about valuing the concern as a whole—each party for itself. He thought there ought to be some combination, so that they should all value it together; and therefore it seemed to him that the cross-examination for all the Unions ought to take place—so far as the valuation of the whole undertaking was concerned—at the same time.

After further argument as to whether the other parishes—Greenwich, Woolwich, Holborn, Islington, and St. Pancras—should enter the case now being heard, or let their appeals stand over until after the hearing of the City of London appeal,

The Chairman said: I think we should be right in saying this much: If there are any parishes who hereafter want to come into the case and retry the whole of it, they will do it at their own peril. They must either come here to cross-examine, or else must take the consequences.

Alleged Negligence in Filling a Trench.

In the King's Bench Division of the High Court of Justice last Thursday, before Mr. Justice Coleridge and a Common Jury, an action was brought by a Mr. Symes against the Amersham, Beaconsfield, and District Water-Works Company, Limited, and Messrs. Langley, Hardy, and Johnson, to recover damages in respect of personal injuries alleged to have been caused by the defendants or their servants on May 4, 1905, through negligently filling in a trench or opening made by them in the high road near Gerard's Cross. It was said that the trench was filled in in such a way as to leave a ridge of earth and stones several inches higher than the general level of the road, and that it was not fenced in. The plaintiff was in a trailer which was being drawn by a motor-cycle ridden by his brother, and the trailer was overturned, the occupant sustaining serious injury. Defendant Company denied that the trench had been made by them, or had been filled up by them or their servants negligently or at all. The trench was lawfully made by the other defendants named for the Company in the execution of their statutory powers as undertakers for the supply of water for the district. The defendants further pleaded that the accident was caused through the contributory negligence of the plaintiff. Mr. Symmons and Mr. Drincquer appeared for the plaintiff; Mr. Bankes, K.C., Mr. Matthews, Mr. M'Call, K.C., and Mr. Groser represented the defendants. In the result, the Jury, after deliberating in private for two hours, disagreed, and were discharged.

Effect of Pumping on Running Water.

In the Court of Appeal, on the 1st inst., before Lord Justice Vaughan Williams and Mr. Justice Bigham, the case of *English v. Metropolitan Water Board* was considered. Mr. Bailhache explained that it was an action to restrain the defendants from so using their pumping plant near the plaintiff's land as to diminish the flow of water as a natural running stream. The action was tried early in the year (as reported in the "Journal" at the time) before the Lord Chief Justice, who found as a fact that there was a material diminution in the water, but that the plaintiff could not complain, as it occurred by reason of the defendants' pumping operations lowering the level of underground water, and was not the result of a direct tapping of the stream in question. The plaintiff relied in the Court below on the case of *Shugar v. Grand Junction Canal Company*, in which it was decided that though a landowner could not, in general, be restrained from drawing on subterranean water in adjoining land, he would be if he drew off water running in a defined channel through that land. The plaintiff had now been able to procure the loan of the plans used in the case relied upon, and Counsel said his application was that when the appeal came on these plans might be put in as evidence. Mr. Eldon Bankes, K.C., for the defendants, opposed the application, as there was nothing to show that the plans which were made on behalf of Mr. Shugar were accepted by the Court. He said he understood that the Grand Junction Canal Company also had plans prepared; and it might very well be that the Judge who tried the case thought these were more accurate than those of the plaintiff. Lord Justice Vaughan Williams suggested that the application should stand over, and be made when the appeal came on for hearing. Mr. Bankes offered no objection to this, but did not wish to say anything which would prejudice his right to object to the reception of the plans. Their Lordships ordered the application to stand over, and suggested that the plaintiff should be prepared with evidence to show that the plans were correct.

The Portsea Island Gaslight Company are busily engaged at a Trades Exhibition now being held at Portsmouth. Five rooms are occupied by the Company with cooking and heating stoves, and with the latest improvements in artistic inverted burners and incandescent modes of lighting. The display is of a highly interesting character.

MISCELLANEOUS NEWS.

SHEFFIELD UNITED GAS COMPANY.

Mr. Hanbury Thomas Appointed Managing-Director.

An Extraordinary General Meeting of the Sheffield Gas Company was held on Monday last week—Mr. WILSON MAPPIN in the chair—for the purpose of confirming the appointment of Mr. Hanbury Thomas, the General Manager and Secretary, as Managing-Director, and of fixing the remuneration to be paid to him.

The CHAIRMAN, in opening the proceedings, remarked that Mr. Hanbury Thomas having been the General Manager for 25 years the Directors, in the interests of the Company, unanimously elected him to a seat on the Board. He believed it was largely due to Sir Frederick Mappin and Mr. Thomas that the undertaking was in its present prosperous condition. It was to be regretted that Sir Frederick was unable to be with them. He had often remarked with what tact and discretion Mr. Thomas managed the business of the Company. He moved that Mr. Thomas's appointment as Managing-Director be confirmed, and that he be paid, from the 15th of October, in addition to his ordinary fees as a Director, the sum of £2000 per annum as remuneration for his services.

Mr. H. K. STEPHENSON, in seconding the motion, said the Directors had watched with the utmost satisfaction the business acumen and sound judgment which Mr. Thomas brought to bear on all matters which came before him.

Mr. C. F. BENNETT, as the senior Nominee Director present, supported the motion—saying that Mr. Thomas had well earned and well deserved the position he would fill in future.

The motion having been carried unanimously,

Mr. THOMAS, in expressing his thanks for the vote, said he should like to say a few words respecting the Company. Parliament, in granting the Company the right to supply Sheffield with gas, conferred on them certain privileges, and at the same time imposed various duties, which the Directors, under the able chairmanship of Sir Frederick Mappin, had always put in the forefront of their policy in conducting the affairs of the Company, knowing that in so doing they were best serving the interests of the shareholders. The result of this policy was seen to-day in the very low price charged for gas, and the exceptional security the shareholders had for a continuance of the payment of their full dividends, as the price of gas could be more than doubled before the dividend was affected on any class of the Company's stock. The citizens of Sheffield were proud, and justly so, of their water supply and tramway service; and he believed he was right in saying they were equally proud of their gas supply. He had with him a list of ten of the largest provincial towns in England, showing the price charged for gas in 1887 (twenty years ago) and also at the present time. He did not give the names of the towns, as he did not wish to draw a comparison between Sheffield and any particular place, but merely to show how the Company had progressed. The figures were taken from the Parliamentary Returns and from "Field's Analysis;" and he could verify them if called upon to do so.

Town.	Price, 1887. s.	d.	Price, 1907. s.	d.	
1	2	4	2	1	A reduction of 3d. per 1000 cubic feet.
2	2	8	2	6	,, 2d. ,,
3	2	0½	1	11½	,, 1d. ,,
4	1	9	2	1	An advance of 4d. ,,
5	2	4	2	4	No change.
6	2	6	2	3	A reduction of 3d. ,,
7	2	4	2	6	An advance of 2d. ,,
8	2	3	2	1	A reduction of 2d. ,,
9	1	10	1	9	,, 1d. ,,
10 (Sheffield)	2	2	1	4	,, 10d. ,,

It would be observed that, with the exception of Sheffield, 3d. per 1000 cubic feet was the greatest reduction that had been made; while in one or two instances the price was actually higher than it was twenty years ago. Another reason for giving these particulars was that, whenever the low price charged at Sheffield was mentioned, the subject was at once dismissed by a reference to "local circumstances." He quite admitted that they were favourably situated in Sheffield, but not more so now than they were twenty years ago. Their geographical position was exactly the same to-day as it was then; and he did not agree that the present exceptional position of the Company was solely due to local circumstances. He considered that it was largely owing to the manner in which the business had been conducted by the Board; and he was convinced that, under the present Directors, the Company's prosperity would be fully maintained, to the advantage both of the consumers of gas and the shareholders. In conclusion, he again expressed his thanks for the resolution which had been passed. He said he fully appreciated the honour the Directors had done him in electing him to a seat on the Board; and he could assure the proprietors that he would endeavour to serve the Company as faithfully in his capacity of Managing-Director as he had striven to do during the not inconsiderable period that he had acted as their General Manager.

A vote of thanks was accorded to the Chairman, and the proceedings closed.

BRADFORD CORPORATION ACCOUNTS.

Gas and Water Undertakings.

Mr. G. A. Thorpe, the Bradford City Treasurer, in his volume dealing with the accounts of the Corporation for the year to March 31 last, remarks that the gas-works produced a total income of £286,800; and the working expenses were £221,344, leaving a gross profit of £65,456. Interest on loans absorbed £35,618, and the sinking fund amounted to £26,352—leaving a net surplus of £3486. The surplus at the commencement of the year was £5438, making a total of £8924. Of this, £5000 was appropriated in relief of rates, leaving unappropriated at the end of the year £3924. The total capital expenditure of the gas undertakings has been £1,157,666, of which £333,588 is shown as goodwill in respect of the various Gas Companies' works recently acquired. The total amount already set aside for the reduction of the debt is £326,701; and the sum standing to the credit of the reserve and renewal accounts is £33,000.

The revenue from the water-works during the year was £176,889, and the working expenses £32,963, leaving a gross profit of £143,917. Interest on loans amounted to £109,152, and sinking fund contributions were £31,749, leaving a net credit balance of £3016. The deficit at the beginning of the year was £28,496; and at the end of the year it stood at £25,480. This adverse balance has grown up in recent years through the heavy payments for interest and sinking fund on the Nidd works, which have not yet become fully productive. The equation of the repayment of sinking fund—a change recently effected—will, it is hoped, prevent it getting materially worse in the future; and in time it will right itself. The total capital expended on the water-works is £3,624,882; and the amount of the debt already repaid, or remaining in sinking funds available for the purpose of repayment at the proper time is £684,671. Of the debt, £1,097,481 is in respect to the Nidd works.

QUALITY OF THE GAS AT SHREWSBURY.

The Lighting Committee reported to the Shrewsbury Town Council at the adjourned annual meeting yesterday week that the Gas Examiner (Mr. T. B. Blunt) had had to bring under their notice the fact that, according to the tests made by him, the illuminating power of the gas was below that prescribed by the Act, and that the quantity of sulphur per 100 cubic feet was excessive. For instance, on two days in September, his sulphur test showed 35·15 grains per 100 feet; while the maximum allowed under the repealed regulations was 20 grains per 100 feet. With respect to the illuminating power, three observations on consecutive days in October gave an average of 14·41 candles, whereas the standard was 15 candles. The Gas Company did not admit the accuracy of the tests, and stated that the illuminating power on the dates named, from tests made at the works, was over 16 candles. Mr. Blunt's attention having been called to the Company's contention, he stated that he was absolutely certain as to the correctness of his tests, and pointed out that the Company had not up to the present ever admitted being in the wrong; but he had ascertained that complaints were made from several sources about the quality of the gas supplied at the time in question, which entirely corroborated the results he arrived at. The Committee said the Council would now see that it was to be regretted that the opposition to the Sulphur Restrictions Removal Bill was not persevered with; and that it had become necessary for the Committee, in the interests of the ratepayers, to consider what steps should be taken to enforce the provisions of the Act with regard to the illuminating power of the gas supplied, as it was evident they could not allow the Company to continue to question the accuracy of tests made by the Examiner appointed under the Act.

Referring to the report (which was subsequently adopted) Alderman Deakin said he could not help thinking, and he believed the Council generally would think, that the replies from the Gas Company were not satisfactory. The Council had nothing to do with the tests made by the Company. They had to do with those carried out by their own Examiner appointed under the Act; and it was for the Council to see that the gas was of the necessary illuminating quality. The Council, with other corporations, up to a certain point opposed a Bill framed by the gas companies to repeal the sulphur restrictions; but they were informed that the same caution would be taken with regard to sulphur as had been the case previously. Under the old Act, the Company were restricted to 20 grains of sulphur per 100 cubic feet; now the analysis showed 35·15 grains. The Council had no powers in the matter; but it was important to consumers, because the sulphur was damaging to papers, pictures, and all kinds of decorations. Mr. Woodhouse asked whether the testing apparatus was in thoroughly good condition; and Alderman Deakin replied that there was no contention that the testing apparatus was not in perfect order. Even, however, if it was not in order, the responsibility rested with the Gas Company, who had to maintain it under the Act.

RATES AND GAS, ELECTRICITY, AND WATER CHARGES.

We have received from Mr. James Carter, the Borough Treasurer of Preston, a copy of his tabulated statistics of the rates levied and collected, and the charges made for gas, electricity, and water, in a number of Provincial towns and a few Metropolitan boroughs, for the year 1907-8. There are in all ninety places referred to, which is one more than in the previous compilation. The populations range from 746,144 (Liverpool) down to 21,054 (King's Lynn). The rateable values are highest in Westminster (£6,211,437), Liverpool (£4,664,015), and Manchester (£4,191,039); and lowest in King's Lynn (£84,916), Bacup (£86,086), Brighouse (£87,727), and Stafford (£89,674). The places most heavily rated are: East Ham, 9s. 8d.; West Ham, 9s. 7d.; Norwich, 9s. 5d.; Halifax, 9s. 2d.; Wolverhampton, 9s. 2d.; Brighouse, 9s. 0d.; Rotherham, 9s. 0d.; and Wigan, 9s. 0d. in the pound. Those which have the lightest rates are: Oxford, 4s. 8d.; Lancaster, 4s. 10d.; and Bournemouth, 5s. 0d. in the pound. Out of the rents of property and profits transferred from municipal undertakings, the rates are reduced in the following towns to the extent named: Carlisle, 1s. 8d. in the pound; Macclesfield, 1s. 7d.; Warrington, 1s. 4d.; Nottingham, 1s. 3¾d.; Leicester, 1s. 1½d.; Stockport, 1s. 1d.; Salford, 1s. 0¾d.; Burnley, 1s. 0½d.; Bolton, 1s. 0d.; Leeds, 1s. 0d.; and Stafford, 1s. 0d. Bootle relieves the rates to the extent of ½d. in the

pound; Bradford similarly contributes ½d.; Hampstead, ½d.; West Hartlepool, ½d.; and Wakefield, ¾d.

Coming to the table giving the charges of gas and water, we find that the price of the former for domestic supplies is again highest at King's Lynn—3s. 6d. per 1000 feet; and Widnes is once more lowest with 1s. 3d. per 1000 feet (while there is, of course, an even lower rate for very large consumers and engines). The following towns also enjoy the privilege of a gas supply at 2s. 0d. or less per 1000 cubic feet: Gateshead, 1s. 9⅜d.; Newcastle, 1s. 9⅜d.; Belfast, 1s. 11d.; Plymouth, 1s. 11d.; Bury, 1s. 11d.; Sunderland, 1s. 11d.; Bradford, 1s. 11⅜d.; Bath, 2s. 0d.; Bristol, 2s. 0d.; Darlington, 2s. 0d.; Lancaster, 2s. 0d.; and Tynemouth, 2s. 0d. The charge per B.T.U. for domestic supplies for electricity ranges from 6d. at Bournemouth and Oxford, down to 3d. at West Ham. The charge for water for domestic purposes on a house of £15 rateable value is highest at Ashton-under-Lyne—2s. 1⅜d. in the pound. It is lowest in the following towns: King's Lynn, 7d.; Liverpool, 7½d.; Manchester, 8d.; Brighton, 9d.; Leamington, 9d.; Kensington, 9½d.; Westminster, 9½d.; and Islington, 9⅜d. The other places in which the charges are less than 1s. are: Birkenhead, Bournemouth, Gloucester, Oxford, Plymouth, Reading, Salford, Widnes, and York. At Preston (Mr. Carter's own town), the local rates are 8s. 9d. in the pound; and they are relieved to the extent of 7d. by the rents of property and the profits transferred from the reproductive undertakings. The price of gas is 2s. 11½d. per 1000 cubic feet; of electricity, 4½d. per unit; and of water, 1s. 2d. in the pound on £15 houses.

There is a table showing the amount estimated for the current year to be transferred to the borough, district, or other fund from the various profitable undertakings.

THE NEW AUSTRALIAN TARIFF.

Electricity Favoured and Gas Burdened.

Reference has already been made in the "JOURNAL" to the new Australian tariff. The matter has been investigated by Mr. R. J. Lukey, the Secretary of the Australian Gaslight Company, who has found that many of the duties suggested are not only detrimental to the interests of all public, private, and municipal gas undertakings within the Commonwealth, but concede undue preference to suppliers of electricity. As representing the oldest Gas Company in Australia, therefore, he has addressed a circular-letter to the secretaries or managers of other companies, calling their attention to the new tariff. In the course of his letter he says: "My desire is—and I feel sure you will agree with me—that the two industries should receive equal treatment; but in many instances electricity is much more favourably considered than gas, which is not an equitable procedure. With a view to obtaining from the Federal Parliament the consideration so earnestly desired, I would suggest that you communicate with the representative for your district, point out to him the anomalies complained of, and solicit his support in obtaining an adjustment of same." Mr. Lukey gives in parallel columns some of the items he has collected from the Customs tariff; and we reproduce them.

Gas.	Duties.		Electricity.	Duties.	
	Foreign.	British.		Foreign.	British.
	Per Cent.	Per Cent.		Per Cent.	
Water and gas meters	30	25	Testing meters and instruments	5	Free
Meter parts	30	25	Cycle parts (equal to meter parts)	15	10 p. ct.
Incandescent mantles	40	30	Carbons (equal to incandescent mantles)	5	Free
Cast-iron mains for gas	30	25	Cables for electricity	5	"
Globes—					
Cut, embossed, &c.	2/6 per cub. ft.	= 250	Incandescent electric lamp and bulbs, arc lamps.	25	15 p. ct.
Not cut	1/6 per cub. ft.				

Mr. Lukey says that, speaking generally, the duties upon cast-iron main-pipes have been increased from 20 to 25 per cent.; while casks for the storage of fire-clay, which were formerly free, are now subject to a duty of 5s. each, though they are of no value when empty. Another important item is the doubling of the duty on gas machinery (from 12½ to 25 per cent.), the major portion of which cannot be manufactured in the Commonwealth. He commends these matters to the serious attention of his colleagues.

THE CHARGE FOR WATER IN LONDON.

At the Meeting of the London County Council to-day, the Local Government Committee will present the following report on the Metropolitan Water Board (Charges) Act of last session.

We have had under consideration the Metropolitan Water Board (Charges) Act, 1907, which comes into force on April 1, 1908, in its effect upon local taxation. As has already been pointed out in the various reports presented by the Parliamentary Committee, one of the most important changes made by the Act is to fix "rateable value" as the basis on which the water-rate is to be charged in future throughout the limits of supply of the Metropolitan Water Board. We need hardly point out that, though a common description of assessment is prescribed, the Act will not, as matters at present stand, result in a uniform or equal basis. Owing to the difference in the law and practice of valuation in London on the one hand, and in the remaining districts within the area of supply on the other, a very considerable inequality of assessment exists in the two portions of the area under the jurisdiction of the Board. Though this inequality is admitted, it has been urged, as stated in the reports of the Parliamentary Committee above referred to, that it will soon be rectified by the amendment of the law of valuation. It is, however, possible that a considerable time may elapse before legislation on the subject takes place. We have therefore considered what steps might in the meantime be taken, in the interests of the County of London, to minimize the inequalities in the basis of the charges for water. The Metropolitan Water Board, as ratepayers in every parish in which they supply water, are entitled to object to the assessment of any property within their limits of supply, and by this means it might be possible to rectify at any rate some part of the admitted irregularity of assessment. We have therefore suggested to the Board that they should consider as to exercising this power; and we have informed the Board that we shall be prepared to recommend the Council to co-operate, as far as practicable, in any steps which it may be decided to take to secure that "rateable value" shall give, as far as possible, a uniform basis of charge throughout the Metropolitan water supply area. The Board have expressed their thanks for the suggestion, and have stated that the points raised will receive careful consideration.

TEES VALLEY WATER BOARD.

History of the Undertaking.

Sir Hugh Bell, who has presided over the Tees Valley Water Board during the 31 years it has existed (in addition to having assisted in its formation), has now retired; and his former colleagues, and some other prominent public men of the district, entertained him last week at dinner, at the Middlesbrough Town Hall.

In proposing "Success to the Tees Valley Water Board," Sir Hugh gave an interesting account of the undertaking. In recounting the circumstances under which the Board came into existence, he said that in 1850 or 1851 a body of gentlemen applied to Parliament for power to supply Stockton, Middlesbrough, and Yarm with good and wholesome water. From this little root, sprang all that great enterprise, over which it had been his privilege to preside for 31 years. Middlesbrough and Stockton went on growing; and Act after Act was applied for in order to meet the necessities of these great hives of industry. In 1858, application was made to Parliament for further powers; and section 70 of the Act contained a clause which was to give rise to many a bitter discussion and much ill-feeling, and to call for many an anxious hour of consideration. It was what they were accustomed to call the "ironmasters' clause," but which it would be far better to term the "large consumers' clause." Then 1870 and 1881 were years of remarkable prosperity; and the district grew in an extraordinary way. In 1875, the Company went to Parliament to seek additional powers; and Stockton and Middlesbrough then banded themselves together by their Corporations to secure the means to enforce upon the Water Company the provision of good and wholesome water. The result was that the Company's Bill was rejected, on the undertaking that the towns would go to Parliament the following year with a scheme of supply from sources free from pollution. The scheme was prepared; and then ensued before the Parliamentary Committee a very prolonged and bitter fight with Darlington. Had more prudent counsels prevailed, it would have been possible to have acquired the water undertaking on much more favourable terms than those on which it was purchased. It cost them fully £250,000 more than it might have been bought for. The district depended for its well-being upon an abundant and unfailing supply of water. This could only be obtained from the River Tees; and if it was only to be got by imposing some burden on the ratepayers, they had better pay a little more in rates and have plenty of employment than pay less rates and see the ironworks standing idle. In spite of bad trade and depression, the district went on growing; and they found that the 60 million gallons, which they were permitted to take from the Tees, was insufficient. Application was then made, and Parliament gave them leave to take an additional 6 million gallons. Six years later, they were still short of water; and they then got leave to take 70 million gallons from the river, on condition that the works were completed by a given date. In 1899, they found it necessary to seek further extension of time for the completion of Grassholme reservoir; and recently the ironmasters, in a friendly and generous manner, had agreed that until the reservoir was completed the price of water should be 4¼d. per 1000 gallons for consumers in the boroughs and 4⅜d. outside, and that after the completion of the reservoir the price should be 4d. and 4⅛d. respectively. The extraordinary way in which the industries on Tees-side continued to develop, passed all comprehension; and he was not able to hold out to his successor in the chair the prospect of an easy time. On the contrary, he thought it would be necessary for the Board, within the next few months, to take into consideration what they would do. It was not an easy matter building a reservoir. What they were going to do next year, or the year after, would be to prepare for something which would happen sixteen years hence. It was impossible in a water undertaking to look forward less than sixteen years. The water consumed was now half as much again as it was ten years ago. The policy he commended to them for the future was the wise and statesmanlike policy of the Corporation in the past—not to regard too closely the imposition upon the rates, but rather to look at the thing from a broader and more important standpoint, and to consider that the supply of water in abundant and unfailing quantity was of vital importance to the district as a whole. He did not doubt that the men of Tees-side, who had built up the great district, would be prepared in the future, as in the past, to meet valiantly all the duties which were imposed upon them; and of all these duties none was more important than the great enterprise of the Water Board.

When the annual meeting of the Board was held, the General Manager (Mr. D. D. Wilson) pointed out that the first business was the election of a new Chairman; and thereupon Sir Samuel Sadler took the opportunity of saying how much they all deplored the loss of Sir Hugh Bell. Having lost him, however, it was their duty to choose someone able to follow him; and it was his privilege to ask one of the

oldest members of the Board, Alderman Hind, to take the position. Alderman Hind said he felt it a great honour to be elected to the responsible position of presiding over an authority with something like £3,000,000 of capital; and the position was made more difficult by his having to follow the great Chairman who had just left them. They could, however, hardly expect their undertakings of the future to be anything like so important as those of the last few years. He proposed a vote of thanks to their ex-Chairman for the splendid services he had rendered to the Board and to the district for the thirty-one years he had presided over that authority. This was heartily carried.

NORTHAMPTON WATER SUPPLY.

Additional Ravensthorpe Works.

An inquiry on behalf of the Local Government Board was recently held by Mr. M. K. North, M.Inst.C.E., in the Guildhall, Northampton, into an application by the Corporation for sanction to the borrowing of £12,800 for carrying out additional water-works at Ravensthorpe.

The Town Clerk, in support of the application, stated that it related to a loan to meet the cost of a trial shaft and heading, which had been completed, and for which a temporary loan had already been granted, and proposed buildings and machinery for which no loan had yet been sanctioned by the Board. He proceeded to give a brief history of the water-works undertaking.

The Town Clerk's remarks were supplemented by the Water Engineer (Mr. F. Tomlinson), who said that the Ravensthorpe reservoir was capable of supplying about 1,200,000 gallons per day over three successive dry years. During 1906, 451,119,000 gallons were taken from it for the supply of the town, being an average daily supply of 1,235,000 gallons. Of the 451,119,000 gallons, 425,159,000 were pumped and 25,960,000 were passed to Northampton through the Coton filters by gravitation; being an average of 1,165,000 gallons per day pumped and 71,000 gallons per day supplied by gravitation. During the 21 days from Aug. 27 to Sept. 16, 1906, the domestic water supply for the district was 43,024,000 gallons; being an average of 2,048,000 gallons per day for 21 days. Of this quantity the Ravensthorpe engines pumped 35,363,000 gallons—an average of 1,683,000 gallons per day; and to give this both engines were run together. Under the most favourable conditions, each of the Ravensthorpe engines could be relied upon to give 1,440,000 gallons of water per 24 hours. Had a serious breakdown happened to one of them between the dates named, the service reservoirs in Northampton, which had a capacity of 3 million gallons, would have been emptied in 13 days. The daily consumption rose considerably above the average in frosty weather as well as during a hot summer. The consumption of water per head per day—viz., 17·4 gallons—was very low, and might reasonably be expected to increase. The Water Committee decided to make arrangements, when providing new machinery to pump the water from the new well, for relieving the excessive strain on the existing engines by providing additional pumps capable of raising at least a million gallons in 12 hours to Northampton. In reply to the Inspector, Mr. Tomlinson said he was satisfied that no water was percolating from the reservoir to the well. There was a very thick stratum of clay between.

The Consulting Water Engineer (Mr. John Eunson) said he had been in close communication with Mr. Tomlinson in the matter, and agreed with him. He was satisfied that the scheme as proposed was the best that could be devised under the circumstances. It was most fortunate for the Corporation that they had got into the water-bearing stratum. In reply to the Town Clerk, Mr. Eunson said he did not think they could adopt a more economical method of dealing with the water than the one proposed.

The Inspector commented on the low consumption of water per head in Northampton. He remarked that, from the figures submitted by the Water Engineer, any impartial engineer would say that Northampton had been working for some years very near the requirements mark.

The Chairman of the Water Committee (Mr. A. J. Chown) said the prime reason for commencing the work was because the water in the reservoir at the time, owing to three dry seasons, had gone down some feet, and the Billing Road well was very dry, and they were within measurable distance of a water famine. He thought there was one thing it would be desirable to include in the scheme. The engines used to pump to Northampton sometimes had to raise more than 2 million gallons of water per day. In this scheme, they added to that to the extent of almost half. It seemed to him that it would have been wise to entirely duplicate their present engines by the expenditure of another £1000.

The inquiry then closed, and subsequently the Inspector visited the site.

New Joint-Stock Companies.—The Motherwell Gas Company, Limited, has been registered with a capital of £60,000, in £1 shares, to acquire and carry on the existing undertaking. The Cinderford Gas Company, Limited, with a capital of £20,000, in £1 shares, will acquire the assets and liabilities of the Bilson Gaslight and Coke Company, Limited. There will be no initial public issue in the case of either Company.

Additional Capital for the Redhill Gas Company.—From an announcement which appears elsewhere, readers will see that the Directors of the Redhill Gas Company are inviting tenders for £5000 of their ordinary "B" stock. The growth of the Company's business during recent years has been remarkable, the consumption of gas having increased more than 7 per cent. in the decade ending June 1906; and more capital is absolutely necessary for the extension of mains to outlying districts, and for meeting the increased demand for gas and the appliances required for its utilization. The stock now offered has carried an almost unvarying dividend of 5 per cent. (the standard) since it was created; and the present charge for gas will permit of its continuance.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

We have had to-night a very good meeting of the Eastern District of the Scottish Junior Gas Association. The principal subject discussed was not so much a gas as an engineering one; but in view of the extensive use of hydraulic power in gas-works, consideration of the first principles which control the application of high-pressure water power could not fail to be of great educational value. Mr. J. T. Wight, who contributed the paper, is a teacher in the Heriot-Watt College. His descriptions of hydraulic machinery were very minute and lucid; and he kept the attention of the members throughout a somewhat long discourse. The meeting then engaged in a general discussion upon the question of whether gas should be supplied to consumers at high pressure. It was a pleasure to have opinions from so many of the members—and it is not out of place to again remark that the whole of the speaking was by ordinary members. In the Eastern District, the honorary members make a point of leaving the Association to work in their own way. This is not altogether a disadvantage, because it requires the members to exercise their own faculties, and to rely upon their own resources. In this view, the members of the district are to be congratulated upon the ability they, from month to month, display in the carrying on of their business unaided.

The Corporation of Sanquhar have not been long in putting to the test the question of whether the ratepayers of the burgh approved or not of their acquiring the gas undertaking. It was only on Oct. 28 that it was resolved to take a *plébiscite* of the ratepayers; and on the evening of Monday last the result was announced at a meeting of the Town Council. It was stated that 315 voting papers were sent out, and 226 were returned. There were 131 votes for and 93 against the transfer. Two votes were rejected—one on each side—as doubtful, and 89 papers were not returned. There was a majority of 38 in favour of the transfer. The Council accordingly unanimously resolved to adopt the Burghs Gas Supply Act of 1876; and the transfer will proceed—terms having been agreed upon a year ago.

Sheriff-Substitute Moffat has given his decision in an action which was brought before him in the Small Debt Court at Falkirk, arising out of an explosion of gas following upon an attempt to tamper with a prepayment meter. The pursuer, Thomas Stenhouse, sued the proprietors of the house he resided in—the Falkirk Heritable Property Company, Limited—for £30, restricted to £12, as compensation for the loss and injury he had sustained. He stated that the explosion was the result of an escape of gas from a defective pipe leading from the gas-meter coming into contact with a naked light. The defect was due, he maintained, to the gross negligence and carelessness of the defenders or their factor in failing to examine the gas-piping, and to keep it in good order. In consequence of the explosion, he was incapacitated from work for several weeks; and he further incurred expense for medical treatment. The defenders stated that the pursuer, when he rented the house, undertook to examine it, and to report to them if he found any defect in it. Any defects would have been remedied at once, on complaint being made. They received no intimation of any defect in the pipes; and they were not bound to inspect them. In any case, the defect had been caused by the depredation of some person who had been extracting money from the gas-meter; and they could not be held responsible for the wrongful act of a third party. They further contended that the pursuer had been himself neglectful in approaching the meter with a naked light, after he had been put on his guard that there was something wrong. The Sheriff heard evidence in the case recently. He has now found the defenders entitled to absolvitor. He could not hold that it was the duty of the proprietors to examine all the gas-pipes in the house. It seemed to be that the explosion was the result of the gas-meter being tampered with by someone; and the defenders could not be held liable for that.

The Blackford Gas Company, which is now under new management, have resolved to reduce the price of gas by 10d. per 1000 cubic feet—making it 7s. 6d.

It has been discovered that, by a clerical error, the valuation of the works of the Galashiels Gaslight Company had been overstated by £800; the entry being £2486, instead of £1686. The effect of this will be that the rating authorities will find their income from assessments considerably less than they expected.

In the note last week containing remarks made at a meeting of electors at Inverness, there was an unfortunate mix up of two speakers. The first portion of the paragraph—the optimistic—was by Treasurer Birnie; the second portion—the pessimistic—was by Mr. A. F. Mackenzie, who was endeavouring to capture the Treasurer's seat, and who, of course, had much to find fault with. His remarks are described to me as "not fact but fancy." It is some satisfaction to know that Mr. Mackenzie's gloomy view of the future of the gas undertaking did not impress the electors, who did not return him to the Council, but preferred Treasurer Birnie.

Mr. W. B. M'Lusky, the Engineer and Manager of the Perth Corporation gas undertaking, reported to a recent meeting of the Gas Committee as to the drainage system at the gas-works, and stated that it would be necessary to have a meeting on the ground to consider the subject. He had, he said, full particulars of a system in operation in some places in England, where the effluent from gas-works had had to be chemically treated. The Council have appointed a Committee to go into the matter with Mr. M'Lusky.

In the Denny Town Council this week, the Gas Committee's minutes stated that they had considered a report by the Gas Manager as to the results which would probably be obtained by the introduction of a sulphate of ammonia plant into the gas-works. The cost of the plant and buildings, it was stated, would probably be about £400; and if a plant were laid down, the proceeds from residuals, after deducting capital charges and working expenses, would be considerably less than the amount received at present. After consideration of the Manager's report, along with estimates of the cost of plant, and reports as to results obtained at other gas-works, the Committee unanimously recommended that sulphate plant be not introduced. The Council adopted the recommendation.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Nov.* 16.

Sulphate of Ammonia.

The market has again been quiet, and prices have been rather in favour of buyers. Available supplies are in moderate compass at all points, but direct orders have been very scarce, and those who have November contracts to cover are proceeding about them in a leisurely fashion. The closing quotations are £11 18s. 9d. per ton f.o.b. Hull, £12 2s. 6d. per ton f.o.b. Liverpool, and £12 5s. per ton f.o.b. Leith. The forward position has been neglected, for though there have been inquiries, they have not been very serious. Meantime, Scotch makers stand to their quotations for Spring delivery; but some English makers show a disposition to meet buyers.

Nitrate of Soda.

This article is weak, and spot quotations have been reduced to 11s. and 11s. 1½d. per cwt. for 95 per cent. and refined qualities respectively.

LONDON, *Nov.* 18.

Tar Products.

The markets are still dull, and business difficult to negotiate. Pitch is quiet, with low figures for prompt delivery. In London, the value is not over 23s. 9d. to 24s. 3d.; while on the east coast business has been done at 22s. 6d. to 23s. In Manchester, it is reported that 21s. to 21s. 6d. has been accepted. Creosote is steady; but there is not much business doing. For immediate delivery, one or two parcels have been sold at rather under market value in London. Benzol, 90 per cent., is steady, but at low figures; while 50-90 per cent. and toluol are neglected—consumers being well stocked. Solvent naphtha is quiet, and there is very little business doing. Carbolic acid is steady, and dealers continue to offer rather better figures than those put forward by Continental consumers. Crystals and anthracene are quite neglected. Tar is quiet; and the low prices of products all round are having their effect.

The average values during the week were: Tar, 14s. to 18s. *ex* works. Pitch, London, 23s. 9d. to 24s.; east coast, 22s. 6d. to 23s.; west coast, 21s. to 22s. Benzol, 90 per cent., 8½d. to 9d., casks included; 50-90 per cent., 8½d. to 9d., casks included. Toluol, 9¾d. to 10d., casks included. Crude naphtha, 3½d. to 4d., naked; solvent naphtha, 10½d. to 1s., casks included; heavy naphtha, 1s. to 1s. 1d., casks included. Creosote, London, 2½d. to 2⅝d., naked; North, 2⅝d. to 2¾d., naked. Heavy oils, 3⅛d. to 3¼d., naked. Carbolic acid, 60 per cent., 1s. 7⅜d. to 1s. 8½d., casks included. Naphthalene, £6 10s. to £12 10s., packages included; salts, 37s. 6d. to 42s. 6d., packages included. Anthracene, "A" quality, 1½d. to 1¾d., casks included.

Sulphate of Ammonia.

The market is steady, but there is not quite so much demand as was the case a week or two ago. The position is unaltered, and makers are very well sold. The London Gas Companies quote £12 7s. 6d. to £12 10s; but outside makes are obtainable upon Beckton terms at £12. In Hull, best makes are fetching £12 2s. 6d., and in Liverpool £12 3s. 9d. In Leith, makers ask £12 5s. to £12 6s. 3d.

COAL TRADE REPORTS.

Lancashire Coal Trade.

Matters relating to the coal trade in Lancashire continue on a satisfactory basis so far as coalowners are concerned. The demand for coal of all sections continues extremely satisfactory. The smoothing away of the railway difficulty left little or nothing to trouble about, yet there is a cloud on the horizon in the prospect of a possible great cotton strike. There is a good inquiry just now for gas coal and cannel, and a fair trade is going on with shipping, both on the Ship Canal and at Liverpool. Quotations remain unchanged.

Northern Coal Trade.

The coal trade is rather more varied—the best qualities being firm in price, and in generally full demand; while other kinds are plentiful in supply, and rather weaker in price. In steam coals, best Northumbrians are from 15s. 3d. to 15s. 6d. per ton f.o.b., second qualities from 14s. to 14s. 6d., and steam smalls from about 9s. 9d. to 10s. 6d. The collieries are working fairly well; but the shipments to the North are now much less. In the gas coal trade, the demand is heavier; and the long contracts being usually at prices below those now current, deliveries on these are kept up to the mark. Durham gas coals vary from about 13s. to 15s. per ton f.o.b., according to the quality. There is a large tonnage of gas coals being sent to the South; but it is evident that the transfer of part of the contracts to Yorkshire has had some effect on the trade. Little is doing in new contracts at the present time; but one or two for export are in treaty for next year. Coke is in some cases lower. Gas coke, however, maintains its price at about 19s. to 19s. 6d. per ton f.o.b. in the Tyne.

Scotch Coal Trade.

Coal on the market is more abundant that it has been for months. Ell, which is largely exported, is being pressed for sale. The demand for splint is heavy; and the price is steadier than for other sorts. Steam coal is plentiful. The Conciliation Board met in Glasgow last week to consider the request of the miners for a further advance of wages, but adjourned, without coming to a decision, until the 25th inst. The prices quoted are: Ell 14s. to 16s. per ton f.o.b. Glasgow, splint 15s. to 15s. 3d., and steam 14s. to 14s. 3d. The shipments for the week amounted to 261,767 tons—a decrease of 49,390 tons upon the previous week, and of 21,518 tons upon the corresponding week of last year. For the year to date, the total shipments have been 12,753,368 tons—an increase of 783,980 tons upon the corresponding period of 1906.

The Award in the Geltsdale Water Arbitration.—Acting on the advice of their Counsel (Mr. Balfour Browne, K.C., and Mr. Ernest Page, K.C.), the Water Committee of the Carlisle Town Council have decided to recommend the Council not to further contest the award of the Umpire with regard to the compensation to be paid to Lord Carlisle for damage to his property caused by the works connected with their Geltsdale scheme.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 549.

Issue.	Share.	When ex. Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
500,000	10	Oct. 11	10½	Alliance & Dublin 10 p.c.	19–20	..	5 5 0
268,324	10	,,	7½	Do. 7 p.c.	13–14	..	5 7 2
200,000	5	Oct. 30	7	Bombay, Ltd.	6¼–6¾	..	5 3 8
40,000	5	,,	7	Do. New, £4 paid	4½–5	..	5 12 0
50,000	10	Aug. 29	14	Bourne- mouth Gas and Water 10 p.c.	27⅞–28¼	..	4 18 3
51,810	10	,,	7	Do. B 7 p.c.	11¼–16¾	..	4 3 7
53,200	10	,,	6	Do. Pref. 6 p.c.	14⅜–15⅜	..	3 17 5
380,000	Stk.	Aug. 15	12½	Brentford Consolidated	243–248	..	5 0 10
300,000	,,	,,	9¾	Do. New	182–187	−3	5 1 7
50,000	,,	,,	5	Do. 5 p.c. Pref.	115–120	..	4 3 4
206,250	,,	June 13	4	Do. 4 p.c. Deb.	100–103	..	3 17 8
220,000	Stk.	Sept. 27	11½	Brighton & Hove Orig.	215–220	..	5 2 3
246,320	,,	,,	8½	Do. A. Ord. Stk.	153–158	−2	5 4 5
460,000	20	,,	10	British	40–41	..	4 17 7
104,000	Stk.	Aug. 15	6	Bromley, Ord. 5 p.c.	116–119	..	5 0 10
165,700	,,	,,	4½	Do. do. 3½ p.c.	87–90	..	5 0 0
500,000	10	Oct. 11	7	Buenos Ayres (New) Ltd.	10⅞–11¼	..	6 4 5
250,000	Stk.	June 27	4	Do. 4 p.c. Deb.	91–94	..	4 5 1
150,000	20	July 12	8½	Cagliari, Ltd.	26½–27½	..	6 0 0
100,000	10	—	—	Cape Town & Dis., Ltd.	6–8	..	—
100,000	10	Apl. 26	4½	Do. 4½ p.c Pref.	7–9	..	5 0 0
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	48–50	..	6 0 0
100,000	Stk.	June 27	4½	Do. 4½ p.c. Deb. Stk.	94–96	..	4 13 9
157,150	Stk.	Aug. 15	5	Chester 5 p.c. Ord.	108–110	..	4 10 11
1,443,280	Stk.	,, 29	5 5/16	Commercial 4 p.c Stk.	100–105	..	4 19 0
560,000	,,	,,	5	Do. 3½ p.c. do.	98–103	..	4 17 1
475,000	,,	June 13	3	Do. 3 p.c. Deb. Stk.	91–83	..	3 12 3
800,000	Stk.	,,	6½	Continental Union, Ltd.	110–115	..	5 13 1
200,000	,,	,,	7	Do. 7 p.c. Pref.	138–143	..	4 17 11
460,170	Stk.	—	5½	Derby Con. Stk.	123–125	..	4 8 0
55,000	,,	—	4	Do. Deb. Stk.	102–104	..	3 16 11
486,090	10	July 31	12	European, Ltd.	22½–23½	..	5 2 2
354,060	10	,,	12	Do. £7 10s. paid	17–18	−½	5 0 0
15,182,590	Stk.	Aug. 15	4 15/16	Gas-light and Coke 4 p.c. Ord.	91–93	+1	4 14 7
2,600,000	,,	,,	3½	3½ p.c. max.	86–88	..	3 19 7
3,799,735	,,	,,	4	4 p.c. Con. Pref.	103–106	..	3 15 6
4,193,975	,,	June 13	3	3 p.c. Con. Deb.	81–83	..	3 12 3
258,740	Stk.	Sept. 13	5	Hastings & St. L. 3½ p.c.	93–93	..	5 2 0
82,500	,,	,,	6½	Do. do. 5 p.c.	114–117	..	5 11 1
70,000	10	Oct. 11	11	Hongkong & China, Ltd.	19–20	..	5 10 0
4,940,000	Stk.	Nov. 14	8	Imperial Continental	168–170*	−1	4 14 2
473,600	Stk.	Aug. 15	3½	Do. 3½ p.c. Deb. Red.	91–93	..	3 15 3
195,242	Stk.	Aug. 29	6	Lea Bridge Ord. 5 p.c.	110–120	..	5 0 0
306,083	,,	June 27	4	L'rpool Unit'd Deb. Stk.	108–110	..	3 12 9
£			p.c.				£ s. d.
561,000	Stk.	Aug. 29	10	Liverpool United A	221–223	..	4 9 8
718,100		,,	7	Do. B	160–161	..	4 6 11
152,736	Stk.	Feb. 14	7⅞	Maidstone 5 p.c.	142–147	..	5 3 8
75,000	5	June 27	5	Malta & Medn., Ltd.	4–4½	..	5 11 1
560,000	100	Oct. 1	5	Met. of 5 p.c. Deb.	99–101	..	4 19 0
250,000	100	,,	4½	Melbourne 4½ p.c. Deb.	100–102	..	4 8 3
541,920	20	Nov. 14	3½	Monte Video, Ltd.	10½–11⅛*	+⅛	6 1 9
1,775,892	Stk.	Aug. 15	4⅛	Newc'tle & G'tesh'd Con.	106½–107½	..	4 6 1
466,025	Stk.	June 27	3½	Do. 3½ p.c. Deb.	89–91	..	3 16 11
15,000	10	Aug. 29	10	North Middlesex 10 p.c.	19⅜–20⅝	..	4 17 7
55,940	10	,,	7	Do. 7 p.c.	13–14	..	5 0 0
300,000	Stk.	Apl. 26	8	Oriental, Ltd.	140–145	..	5 10 4
60,000	5	Sept. 13	7	Ottoman, Ltd.	6–6½	..	5 7 8
398,490	5	Oct. 31	7	Primitiva Ord.	6½–7	..	5 0 0
796,980	5	July 31	5	Do. 5 p.c. Pref.	4¾–5¼	..	4 17 7
488,900	100	June 1	4	Do. 4 p.c. Deb.	94–96	..	4 3 4
1,000,000	10	Oct. 11	8	River Plate Ord.	12½–13	..	6 3 1
312,650	Stk.	June 27	4	Do. 4 p.c. Deb.	94–96	..	4 3 4
250,000	10	Sept. 27	8	San Paulo, Ltd.	13–13½	..	5 18 6
125,000	50	July 1	5	Do. 5 p.c. Deb.	48–50	..	5 0 0
135,000	Stk.	Sept. 13	10	Sheffield A	243–245	+1	4 1 8
209,984	,,	,,	10	Do. B	243–245	+1	4 1 8
523,500	,,	,,	10	Do. C	243–245	+1	4 1 8
70,000	10	Nov. 14	10	South African	14½–15⅜*	..	6 9 0
6,429,895	Stk.	Aug. 15	5½	South Met., 4 p.c. Ord.	119–121	..	4 10 11
1,895,445	,,	July 12	3	Do. 3 p.c. Deb.	81–83	..	3 12 3
201,720	Stk	Sept. 13	8	South Shields Con. Stk.	155–157	..	5 1 11
605,000	Stk.	Aug. 15	5½	S'th Suburb'n Ord. 5 p.c.	114–117	..	4 14 0
60,000	,,	,,	5	Do. 5 p.c. Pref.	117–120	..	4 3 4
117,058	,,	July 12	5	Do. 5 p.c. Deb. Stk.	120–125	..	4 0 0
502,310	Stk.	Nov. 14	5	Southampton Ord.	104–109*	−½	4 11 9
120,000	Stk.	Aug. 15	6¾	Tottenham A 5 p.c. and B 3½ p.c.	120–123	..	5 9 9
398,940	,,	,,	5¼		100–103	..	5 1 11
149,470	,,	June 27	4	Edmonton 4 p.c. Deb.	99–101	..	3 19 3
182,380	10	June 13	8	Tuscan, Ltd.	10¼–10⅝	..	7 8 10
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	100–102	..	4 18 0
193,742	Stk.	Aug. 29	5	Tynemouth 5 p.c. max.	107–109	..	4 11 9
30,000	Stk.	Feb. 14	8	Wands- worth A 5 p.c. and B 3½ p.c. and C 3½ p.c.	—	..	—
255,636	,,	Aug. 15	6½		128–133	..	4 17 9
75,000	,,	,,	5		—	..	—
80,075	,,	June 27	3	Putney 3 p.c. Deb. Stk.	75–80	..	3 15 0
845,872	,,	Aug. 15	5⅛	West Ham 5 p.c. Ord.	102–105	..	4 17 7
185,000	,,	,,	5	Do. 5 p.c. Pref.	118–120	..	4 3 4
228,300	,,	June 27	4	Do. 4 p.c. Deb. Stk.	101–104	..	3 10 11

Prices marked * are "Ex div."

Sales of New Issues of Gas Capital.

In accordance with announcements previously made in our columns, Mr. Alfred Richards offered for sale last Tuesday, by order of Directors, new issues of capital in the Worthing, Romford, and Horley Gas Companies. The Directors of the first-named Company had for disposal 400 ordinary £10 shares ranking for a standard dividend of 7 per cent. per annum subject to the sliding-scale—the dividends on existing similar shares having for many years been paid at this rate. They were all sold at premiums of £3 15s. to £4 per share—a price which must be considered very good, having regard to the prevailing depression. Moreover, the Company have been much in evidence of late in connection with their parliamentary proposals, which, it may be remembered, aroused some local opposition, even from certain shareholders. Having regard to all that has been said, it is satisfactory to find that the confidence of investors in the undertaking remains unshaken. Coming to the new issue by the Romford Gas Company, it consisted of some £100 debenture bonds, carrying 4 per cent. interest, of which £1000 worth were sold at par. The Horley Company's issue of new capital consisted of £3000 of additional "B" stock, ranking for a standard dividend of 7 per cent., subject to the sliding-scale; the dividends on the Company's existing similar stock having for the last four half years been paid at the rate of £5 12s. per cent. per annum. It was all sold at £101 to £102 per £100. By order of a private owner, six 4 per cent. mortgage debenture bonds of £50 each of the same Company were sold at the rate of £96 per £100. The remaining item on the particulars of sale was a small parcel of new ordinary stock of the Dover Gas Company, in which for upwards of thirty years the maximum dividend of 7½ per cent. per annum has been paid. It was sold at £146 to £147 10s. per £100, *cum div.* as from the 1st of July last.

Additional Capital for the Southend Water Company.—In accordance with announcements in our advertisement columns, Mr. Alfred Richards will offer for sale, at the Mart, Tokenhouse Yard, E.C., next Tuesday, by order of the Directors, 1000 new ordinary £10 shares in the Southend Water Company. They rank for a maximum dividend of 5 per cent., and are entitled to receive this amount in view of the dividends paid on the Company's existing capital.

Todmorden Gas, Water, and Electricity Undertakings.—The annual statement relating to the Todmorden Gas, Water, and Electricity Departments shows that the first-named has been an unqualified success. The total expenditure on the works has been £162,181; and during the fourteen years the undertaking has been in the hands of the Corporation they have repaid more than a quarter of this amount. The net profit last year was £1413; and there was paid back £2065 of borrowed capital. The cost of the electricity works to date has been £19,500; and the deficit last year was £1453. The total expenditure on the water-works was £95,000, and the debt on this account £87,745. The total debt of the borough is £380,533.

Gas Supply in New Zealand.

We learn from the "Otago Daily Times" that Mr. J. H. Walker, the Chairman of the Gas Committee of the Dunedin City Council, has lately been visiting Christchurch and Wellington, and that when he was in the former city he took the opportunity of inspecting the gas-works in company with the Engineer, Mr. R. English, and found in a forward state the extensions now being carried out. It appears that the fire-bricks used in the construction of the retort-settings are made on the works; and it is stated that the whole of the designs and workmanship in connection with the extensions reflect very great credit on the Engineer. The cost of the works has come well within the estimate; and Mr. Walker feels certain that when once completed the expenditure will be fully justified, and will not exceed the amount put down—viz., £55,000. In Christchurch the consumers are catered for in every way in the matter of gas lighting; and in Mr. Walker's opinion the city is ahead of any of the other centres in this respect. He obtained the cost of the pipes now being laid in Wellington and elsewhere on practically new lines; and, with this information at his command, he feels certain that the Dunedin City Corporation's distributing system in connection with the suburbs will be carried out more economically and expeditiously than is generally expected. This question will be gone into by the local Manager (Mr. J. Hungerford), and the outcome is confidently expected to prove a considerable saving to the city. A practical demonstration was afforded at Christchurch by Mr. English and Mr. R. C. Bishop (the Secretary of the Christchurch Gas Company) of the manner in which they carry out the schemes of lighting; and the information thus gained by Mr. Walker will also be placed before his Committee.

Barrow-in-Furness Water Supply.—The scheme for augmenting the water supply to the borough of Barrow-in-Furness by tapping the River Duddon is now complete. By the conditions under which Barrow may draw water from the Duddon, if more than 3 million gallons of water are going down the river, the borough can take any surplus up to 2 millions per day; and if and when 15 million gallons a day pass down the river, the Corporation may take an additional quantity up to another million gallons per day. A maximum of 3 million gallons can therefore be drawn off in one day. The borough of Barrow has in its other watersheds reservoirs which impound 574 million gallons. The consumption of water in Barrow for industrial and domestic purposes represents about 3½ million gallons per day. The domestic consumption per head of the population in 1897 was 13 gallons per day, but at the present time it is 24 gallons per day; and the new provision now makes it possible for the town to grow to the extent of 60 to 70 per cent. before it is necessary to go for further powers in this direction. The present scheme, which was prepared by the late Mr. W. H. Fox, who was at the time Borough Engineer for Barrow, has cost the town, from first to last, no less a sum than slightly over £150,000.

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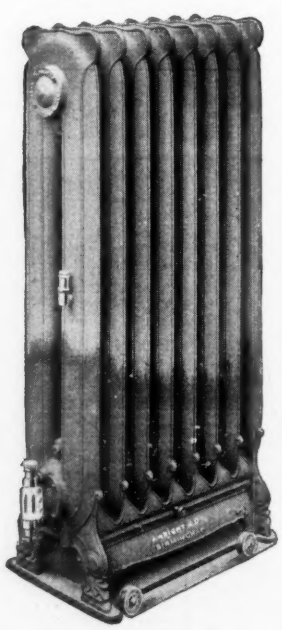

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WRIGHT'S.

Crowborough Gas Company.—At the annual meeting of the Crowborough Gas Company, the Chairman (Mr. R. Howard) reminded the shareholders that the report and accounts (which were adopted) carried them only to March 31 of this year; but the delay was owing to the election of the new Board in September, 1906. The report stated that, acting upon the suggestions of the Consulting Engineer (Mr. Andrew Dougall), the Directors had installed exhausters driven by gas-engines at the works at Crowborough and Mayfield. These had resulted in a larger make of gas per ton of coal; and the advantage would become apparent in the coming year. A new steel tank and second-hand two-lift holder were now nearing completion. The sale of gas had increased to the extent of £225; but owing to the heavy outlay incurred, no dividend was recommended.

Southport Water Board Accounts.—The annual balance-sheet just issued of the Southport, Birkdale, and West Lancashire Water Board shows that there continues to be a steady increase in the revenue of the undertaking, while at the same time the working expenses have been reduced. On the capital account, the principal owing at March 31 was £928 522, as compared with £912,277 twelve months before. The increase has been spent on the completion of the new reservoir at Gorse Hill, the commencement of the construction of the pumping-station at Bickerstaffe, the extension of new headings at the Springfield pumping-station, and the usual work of laying new mains. The receipts amount to £43,186, as against £42,240 last year. This increase represented the normal growth of income due to the extension of the Board's area of supply. The deficiency this year, which will have to be made up by the ratepayers of Southport and Birkdale, is £6368, or only 5d. less than last year. The precept will therefore be practically just the same (about 3½d. in the pound), though this will be slightly reduced owing to the increased assessable value of the district.

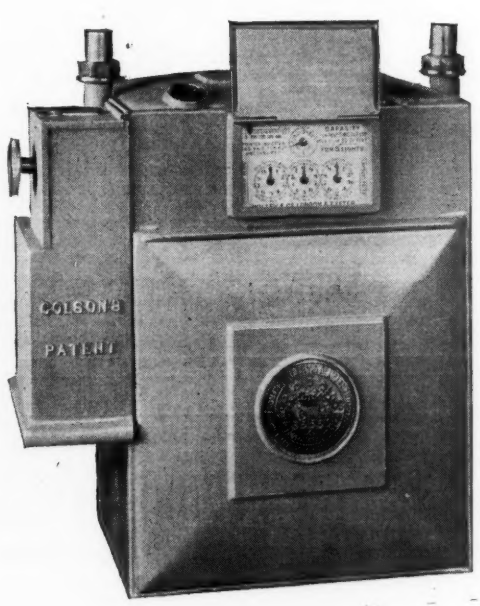
Brampton Water Supply.—An inquiry of much interest to four parishes in the east of Cumberland—viz., Brampton, Castlecarrock, Hayton, and Irthington—was recently held at Brampton, by Mr. Brightmore, an Inspector of the Local Government Board. It related to a scheme of water supply for the four parishes at an estimated cost of £14,000, apportioned as follows: Brampton, £2543; Castlecarrock, £918; Hayton, £5007; and Irthington, £5502. It appeared that it was proposed to obtain the water supply from the Geltsdale scheme of the Carlisle Corporation. Under the Carlisle Corporation Act, the Brampton Rural District Council are entitled to be supplied with 220,000 gallons a day. Of this, 120,000 gallons are to be obtained from the Garth Head reservoir, and the remaining 100,000 gallons from another part of the scheme. It was pointed out that for the purposes of the four parishes 114,000 gallons a day were needed at present; and Mr. Dobson, the Chairman of the Brampton Council, suggested that they might confine themselves at present to the 120,000 gallons from Garth Head; leaving the 100,000 gallons to be obtained when needed. By doing this and making modifications in the scheme of distribution, expense might be saved, and the views of those who had appealed about the apportionment would be met. This suggestion was approved.

Drighlington Water Supply.—The Drighlington District Council have decided, on the recommendation of the Water Committee, to enter into an agreement with the Bradford Corporation for a supply of water for a term of thirty years, from Jan. 1 next.

A New Reservoir for Leeds.—The Leeds Water Committee are contemplating the construction of a new reservoir, to be known as the Leighton reservoir, situate on Pott Beck, near Masham. The contract will be part of the Ure Valley scheme passed by Parliament in 1901. Owing to uncertainty in the strata, many trial boreholes have had to be sunk, and designs prepared. The work that is now to be let will be one of the largest reservoirs of the system, and will contain over 1100 million gallons of water, with a depth of 105 feet. The embankment will be 1308 feet long, and the tunnel by which the water will be discharged from the reservoir 141 feet long. The amount of water that will be available for Leeds by the building of this reservoir will be considerably more than 4 million gallons a day. The drainage area from which the new reservoir will be supplied extends over about 4700 acres; and the rainfall is 41 inches.

Potteries Federation Scheme.—At a conference last Tuesday of representatives of Hanley, Burslem, Stoke-on-Trent, Longton, and Fenton (presided over by Major Norton, of the Local Government Board), the following resolutions were agreed to: That the gas and electricity concerns of the Potteries, towns be bought by the new amalgamated borough at a valuation—the towns owning the works to receive the value as fixed by the valuers, less the outstanding loans, which outstanding loans shall be discharged by the new borough; that all charges with respect to secondary education be common to the new borough; and that all charges for elementary education, except loans, be common to the new borough. These proposals will now be laid before the different Councils; and in the event of the Councils failing to agree, the Local Government Board have promised, if requested, to draw up a financial basis for federation.

Long Eaton Gas Charges.—At the monthly meeting of the Long Eaton Urban District Council, Mr. Chester gave notice of the following motion: "That in view of the Long Eaton Gas Company charging 2s. per 1000 cubic feet for gas at Breaston and Draycott, as against 3s. per 1000 feet at Long Eaton, this Council petition Parliament for a searching inquiry with a view to ascertaining the cause of the overcharge at Long Eaton." The Clerk (Mr. E. Williams) said the resolution would not be effectual. There was no machinery by which Parliament could make inquiries. Mr. Chester replied that the Gas Company's powers enabled them to charge an extra 1s. outside the town, but not to make a less charge. The Clerk said that was the difficulty. The method proposed was not the best way to deal with the question; but he did not know what was the best way. Mr. G. E. Stevenson remarked that whatever the Gas Company had done they had done legally. Mr. Chester's facts were altogether wrong; but as the whole matter was coming under the arbitrament of Parliament, Long Eaton would have plenty of time to petition in due course.



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York in Darkness.—York was thrown into complete darkness early last Wednesday morning owing to the failure of the electric current, consequent, it is stated, on water making its way into the conduits.

Gas Purchase Proposal at Wath-upon-Dearne.—At a special meeting, the Wath-upon-Dearne Urban District Council decided to promote a Bill in the next session of Parliament for the purpose of empowering them to purchase the local gas undertaking, and to enable them to borrow the necessary amount of money.

Shanklin Water Supply.—The ceremony of turning the first turf at Chillerton, in the Isle of Wight, for the auxiliary supply of water to the Shanklin district, was performed last Tuesday by Colonel H. G. Gore-Browne, V.C. A few explanations were given in regard to the improvements which would follow the new supply, the loan for which has already been sanctioned by the Local Government Board.

Gas Explosion at Lisburn.—A shop and house in Lisburn were extensively damaged by a gas explosion last Sunday week; and the proprietor and his wife were somewhat severely injured. The cause of the accident was not apparent. It was stated that for some days a smell of gas had been noticed; but on the morning of the occurrence the shop portion of the premises, where the explosion took place, had been several times entered, and no light was used. The Gas Company's employees immediately started making excavations, with the view of ascertaining if any of the mains were defective.

Oriental Gas Company, Limited.—At the meeting of this Company to-morrow, the Directors will submit the statement of accounts for the year ended the 30th of June last. They express their pleasure in reporting a considerable increase in the Company's business; the total revenue for the year being nearly £3600 above that of the preceding twelve months. Following as it does on increases in the preceding years, the result of the past year's working may, they think, be regarded as very satisfactory. The balance on the profit and loss account is £22,038, out of which they recommend the payment of a dividend of 4½ per cent., free of income-tax; making a total dividend of 8 per cent. for the year, and leaving a balance of £8538.

Fatal Sequel to the Gas Explosion in Arbroath.—On Saturday, the 2nd inst., Mr. George Christie, of Arbroath, died at his residence as the result of injuries sustained by an explosion of gas in the offices of the Arbroath Gas Corporation on the morning of the 27th of September. Mr. Christie and his partner were passing the office at the time. One of the windows was blown out, and both men were thrown down and cut and burned. Mr. Christie had so far recovered as to be able to devote some attention to his business, though he did not seem to have regained his usual health. Erysipelas set in, and he was confined to the house. His death was attributed to shock, caused by the explosion, and his injuries. Intimation has been made to the Town Clerk that a claim for compensation, on behalf of both gentlemen, is under consideration.

Sequel to a Manchester Water-Works Contract.—On the completion of the second line of pipes from Thirlmere to Manchester, the Lancaster Rural District Council sued the Contractors for the half-length in the Lancaster and Preston district, Messrs. Fisher and Le Fanu, for damage to the highways in the townships of Ellet and Wyresdale. The action was heard at the Liverpool Assizes, before Mr. Justice Sutton, and a sum of £500 awarded to the District Council. The case was taken to the Court of Appeal, where it was decided that the previous verdict was wrong, and that the Contractors should not be charged with the whole of the repairs to the highways, but with a proportion only. Surveyors were appointed on each side to assess the amount; and they have agreed to £175 damages. This was endorsed by the Lancaster Rural District Council at their meeting last Saturday week.

Finsbury Borough Council and the Price of Gas.—At the last meeting of the Finsbury Borough Council, Mr. Garrity brought forward a motion to the effect that, in view of the new charge for meter-rents about to be imposed on the customers of the Gaslight and Coke Company, which would seriously affect the ratepayers of the borough, who were already called upon to pay 8d. per 1000 cubic feet in excess of the charge made by the South Metropolitan Gas Company, the Council should petition the Board of Trade to institute a searching inquiry into the management of the first-named Company, with a view to ascertaining the cause of the overcharge for gas. In the course of his remarks upon the motion, he said he had no sympathy with people who had gas-meters just to serve as a stand-by in case the electric light failed; but he contended that thousands of the poorer ratepayers should not be taxed for the want of consideration of a few. The motion was carried.

Incandescent Gas Lighting in Battersea.—At the meeting of the Battersea Borough Council last Wednesday, the Lighting Committee reported that they had had under consideration the question as to improving the present system of public lighting in the district of the Gaslight and Coke Company. It appears that a portion of the Nine Elms ward is already lighted by electricity, and an application was made to the London County Council as far back as April last for their sanction to a loan of £2270 for lighting in the same way the roads on the Park Town Estate. After negotiation with the Council, the Committee were in receipt of a communication from the Finance Committee, stating that they did not see their way to recommend the Council to sanction the loan in question. The Committee of the Battersea Council said they had obtained the following terms from the Gaslight and Coke Company for changing the flat-flame burners of the lamps in their district into the incandescent system: (1) To convert 833 lamps for the sum of £826, excluding repaving works, and to spread this cost over four years; (2) to reduce the present charges for gas and maintenance by £268 a year, so that with a four years' contract £60 per annum would be saved immediately, and £268 after four years. The Company promised to effect the conversion as early as possible, in order that the improved lighting (estimated at six times the illuminating power of the flat-flame burners) might be provided before the winter. The estimated cost of the repaving works to be carried out by the Council would not exceed £20. The Committee recommended that the Company's terms be accepted; and this was agreed to.

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GAS FIRES
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EXCEPTIONAL
MERIT & VALUE.

The "ACORN."
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PRICE from 22s. 6d. each.

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Bath House, 57-60, Holborn Viaduct, E.C.

Australasian Agents:
JAMES HURLL & CO., Ltd., 20, Loftus Street, SYDNEY,
and Box No. 4 (G.P.O.) Dunedin.

Chepstow Water Purchase Question.—At the meeting of the Chepstow Urban District Council yesterday week, the Water Committee reported that they had offered the Water Company £4500 for their undertaking; but the Company regarded the offer as inadequate, and rejected it. Here the matter rested; and the Committee recommended the payment of £65 to Mr. Taylor, of Newcastle-on-Tyne, for his inspection of sources of supply. Discussion was deferred till the next meeting. The Committee also reported on the proposal of the Chepstow Company to supply Pwllmeyric with their surplus water supply. The Council felt they were not justified in going to the expense of opposing the scheme at law, but thought it desirable to safeguard the interest of Chepstow and St. Arvans; and a letter was decided upon protesting against the Company's extension of the limits of their supply, and informing them they would be held responsible for their action in the event of the Chepstow water supply being affected.

At the busiest time in the evening last Saturday week, the gas throughout Brynmawr for some reason went out, and business establishments had for a time to resort to candles and oil-lamps.

The Barry Urban District Council have decided to take Counsel's opinion as to the claim of Mr. F. M. Harris, their Gas Engineer, for £643—being 2¼ per cent. commission on new works executed.

The Portsmouth Water Company have suffered heavy loss by robbery at their works at Bedhampton. Not only was a massive metal bell, weighing 56 lbs., stolen by a man named Harry Taylor, but he dismantled a 10-H.P. engine of its brass fittings to the value of £20. The Magistrates at Havant sentenced him to one month's hard labour.

The tenders which were recently invited in our advertisement columns for the issue of £15,000 of "D" 5 per cent. stock of the Croydon Gas Company were opened last Wednesday, and the whole of the stock was allotted at prices ranging from £107 to £112 per £100; applicants at the lower price receiving 70 per cent. of the amounts tendered for. The average price obtained was £108 13s. 6d.

Some evenings ago, just before the beginning of an entertainment at the Edmonton Town Hall, one of the electric wires which had been laid on for the occasion fused and took fire, causing dense volumes of smoke in the crowded building, which was packed with people. A cry of "fire" was immediately raised; but some of the members of the orchestra mounted the platform and began playing, thus reassuring the audience. The Superintendent of the fire brigade and one of his men were present in the hall, and were able to extinguish the outbreak, though not before five persons had been slightly burned. First aid was rendered afterwards to the injured persons; and the performance was proceeded with.

LEAFLETS FOR DISTRIBUTION.

"ILLUMINATING TRUTHS FOR HOUSEHOLDERS."

No. 1.—"The Sanitary Aspects of Gas and Electric Lighting."
No. 2.—"The Cleanliness of Illuminants: The Eyesight."
No. 3.—"Fire Risks."
No. 4.—"The Relative Cost of Gas and Electricity, and Matters affecting it."
No. 5.—"On Reliability, with Instances of Misplaced Confidence."
No. 6.—"On Shop Lighting, with Special Reference to the Flame Arc Lamp."

This series of Leaflets will be useful, not only for distribution among Householders generally, but for circulation among Shareholders to fortify them with arguments in defence of the commodity in which they have invested capital. Copies of each Leaflet should also be kept in every Gas Undertaking's Show-Rooms.

Prices for Quantities on Application to WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.
WORKS MANAGER (STOVE WORKS). No. 4868.
DRAUGHTSMAN. W. C. Holmes & Co., Huddersfield.
ERECTION OF ACETYLENE INSTALLATIONS. No. 4860.
GAS-FITTER, &c. Wilmslow Gas-Works.
METER REPAIRER. Wilmslow Gas-Works.

Situations Wanted.
REPRESENTATIVE. No. 4869.
REPRESENTATIVE (GAS STOVE). No. 4871.

Investment and Directorship Wanted. W. E., c/o Horncastle's, London.

Patent for Disposal.
COMPRESSED GAS. Rosenberg and Goldschmidt, Hamburg.

Plant (Second-Hand) for Sale.
BOILER. Redditch Gas-Works.
METER (250-LIGHT). Tiverton Gas-Works.

Plant, &c., Wanted.
CHEMICAL WORKS. No. 4870.

Stocks and Shares.
BRISTOL GAS COMPANY. Dec. 5.
REDHILL GAS COMPANY. Dec. 3.
SOUTHEND WATER COMPANY. Nov. 26.
WALKER AND WALLSEND GAS COMPANY. Dec. 2.

TENDERS FOR

Fire-Clay Goods.
BATH GAS COMPANY. Tenders by Dec. 10.
LEEDS GAS DEPARTMENT. Tenders by Nov. 23.

Fires and Grillers.
GLASGOW GAS DEPARTMENT. Tenders by Dec. 9.

Tar and Liquor.
DARENTH ASYLUM. Tenders by Nov. 25.

OXIDE OF IRON.

O'NEILL'S OXIDE
For GAS PURIFICATION.
LARGEST SALE OF ANY OXIDE,

SPENT OXIDE PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LD.,
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"VOLCANIC" FIRE CEMENT.
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CARBURINE FOR GAS ENRICHING.
ALSO
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LONDON, E.C.
Telegraphic Address: "Carburine, London."

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BALE'S FIRE CEMENT.
PAINT FOR GAS-WORKS.
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with which is amalgamated WM. PEARCE & SONS, LTD.
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The Asylum is Three Miles from Dartford, where the Tar can be conveyed by barge or rail in consignments of about 150 Barrels at a time.
Barrels not provided.
Tenders, to state price per Barrel of 40 Gallons at the Asylum, to be endorsed "Tenders for Gas Tar, Darenth Asylum," and to be delivered at the Office of the Board, Embankment, London, E.C., not later than Four p.m. on Monday, Nov. 25.
Nov. 13, 1907.

LEEDS CORPORATION GAS-WORKS.
THE Gas Committee are prepared to receive TENDERS for the Supply of FIRE-CLAY RETORTS, FIRE-BRICKS, FIRE-BRICK LUMPS, and FIRE-CLAY.
Specification and Form of Tender may be obtained on Application to the undersigned.
Tenders, endorsed "Fire-Clay Goods," addressed to the Town Clerk, Town Hall, Leeds, must be delivered not later than Saturday, the 23rd inst.
The Committee do not bind themselves to accept the lowest or any Tender.
R. H. TOWNSLEY,
General Manager.
Gas Offices, East Parade,
Leeds, Nov. 12, 1907.

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(GAS DEPARTMENT.)
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The Corporation do not bind themselves to accept the lowest or any Tender.
A. W. MYLES,
Town Clerk.
City Chambers, Glasgow,
Nov. 15, 1907.